PHILIPS MEDICAL SYSTEMS

Mx8000 Systems

Installation Manual

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NOTICE

THE INFORMATION CONTAINED IN THIS MANUAL CONFORMS WITH THE CONFIGURATION OF THE EQUIPMENT AS OF THE DATE OF MANUFACTURE. REVISIONS TO THE EQUIPMENT SUBSEQUENT TO THE DATE OF MANUFACTURE WILL BE ADDRESSED IN SERVICE UPDATES DISTRIBUTED TO PHILIPS MEDICAL SYSTEMS (CLEVELAND), INC. TECHNICAL SERVICE ORGANIZATION.

TO THE USER OF THIS MANUAL

THE USER OF THIS MANUAL IS DIRECTED TO READ AND CAREFULLY REVIEW THE INSTRUCTIONS, WARNINGS AND CAUTIONS CONTAINED HEREIN PRIOR TO BEGINNING INSTALLATION OR SERVICE ACTIVITIES. WHILE YOU MAY HAVE PREVIOUSLY INSTALLED OR SERVICED EQUIPMENT SIMILAR TO THAT DESCRIBED IN THIS MANUAL, CHANGES IN DESIGN, MANUFACTURE OR PROCEDURE MAY HAVE OCCURRED WHICH SIGNIFICANTLY AFFECT THE PRESENT INSTALLATION OR SERVICE.

THE INSTALLATION AND SERVICE OF EQUIPMENT DESCRIBED HEREIN IS TO BE PREFORMED BY AUTHORIZED, QUALIFIED PHILIPS MEDICAL SYSTEM PERSONNEL. ASSEMBLERS AND OTHER PERSONNEL NOT EMPLOYED BY NOR DIRECTLY AFFILIATED WITH PHILIPS MEDICAL SYSTEMS TECHNICAL SERVICES ARE DIRECTED TO CONTACT THE LOCAL PHILIPS MEDICAL SYSTEMS OFFICE BEFORE ATTEMPTING INSTALLATION OR SERVICE PROCEDURES.

INSTALLATION AND ENVIRONMENT

EXCEPT FOR INSTALLATIONS REQUIRING CERTIFICATION BY THE MANUFACTURER PER FEDERAL STANDARDS, SEE THAT A RADIATION PROTECTION SURVEY IS MADE BY A QUALIFIED EXPERT IN ACCORDANCE WITH NCRP 102, SECTION 7, AS REVISED OR REPLACED IN THE FUTURE. PERFORM A SURVEY AFTER EVERY CHANGE IN EQUIPMENT, WORKLOAD, OR OPERATING CONDITIONS WHICH MIGHT SIGNIFICANTLY INCREASE THE PROBABILITY OF PERSONS RECEIVING MORE THAN THE MAXIMUM PERMISSIBLE DOSE EQUIVALENT

Diagnostic Imaging Systems - MECHANICAL-ELECTRICAL WARNING

ALL OF THE MOVEABLE ASSEMBLIES AND PARTS OF THIS EQUIPMENT SHOULD BE OPERATED WITH CARE AND ROUTINELY INSPECTED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS CONTAINED IN THE EQUIPMENT MANUALS.

ONLY PROPERLY TRAINED AND QUALIFIED PERSONNEL SHOULD BE PERMITTED ACCESS TO ANY INTERNAL PARTS. LIVE ELECTRICAL TERMINALS ARE DEADLY; BE SURE LINE DISCONNECTS ARE OPENED AND OTHER APPROPRIATE PRECAUTIONS ARE TAKEN BEFORE OPENING ACCESS DOORS, REMOVING ENCLOSURE PANELS, OR ATTACHING ACCESSORIES.

DO NOT UNDER ANY CIRCUMSTANCES, REMOVE THE FLEXIBLE HIGH TENSION CABLES FROM THE X-RAY TUBE HOUSING OR HIGH TENSION GENERATOR AND/OR THE ACCESS COVERS FROM THE GENERATOR UNTIL THE MAIN AND AUXILIARY POWER SUPPLIES HAVE BEEN DISCONNECTED. FAILURE TO COMPLY WITH THE ABOVE MAY RESULT IN SERIOUS OR FATAL BODILY INJURIES TO THE OPERATOR OR THOSE IN THE AREA.

ELECTRICAL-GROUNDING INSTRUCTIONS

THE EQUIPMENT MUST BE GROUNDED TO AN EARTH GROUND BY A SEPARATE CONDUCTOR. THE NEUTRAL SIDE OF THE LINE IS NOT TO BE CONSIDERED THE EARTH GROUND. ON EQUIPMENT PROVIDED WITH A LINE CORD, THE EQUIPMENT MUST BE CONNECTED TO PROPERLY GROUNDED, THREE-PIN RECEPTACLE. DO NOT USE A THREE-TO-TWO PIN ADAPTER.

Diagnostic Imaging Systems - RADIATION WARNING

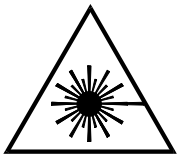
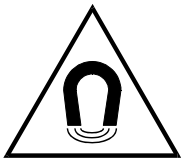
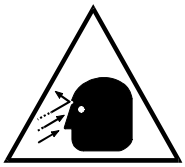
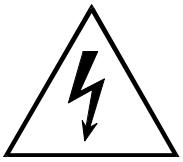
X-RAY AND GAMMA-RAYS ARE DANGEROUS TO BOTH OPERATOR AND OTHERS IN THE VICINITY UNLESS ESTABLISHED SAFE EXPOSURE PROCEDURES ARE STRICTLY OBSERVED.

THE USEFUL AND SCATTERED BEAMS CAN PRODUCE SERIOUS OR FATAL BODILY INJURIES TO ANY PERSONS IN THE SURROUNDING AREA IF USED BY AN UNSKILLED OPERATOR. ADEQUATE PRECAUTIONS MUST ALWAYS BE TAKEN TO AVOID EXPOSURE TO THE USEFUL BEAM, AS WELL AS TO LEAKAGE RADIATION FROM WITHIN THE SOURCE HOUSING OR TO SCATTERED RADIATION RESULTING FROM THE PASSAGE OF RADIATION THROUGH MATTER.

THOSE AUTHORIZED TO OPERATE, PARTICIPATE IN OR SUPERVISE THE OPERATION OF THE EQUIPMENT MUST BE THOROUGHLY FAMILIAR AND COMPLY COMPLETELY WITH THE CURRENT ESTABLISHED SAFE EXPOSURE FACTORS AND PROCEDURES DESCRIBED IN PUBLICATIONS, SUCH AS: SUBCHAPTER J OF TITLE 21 OF THE CODE OF FEDERAL REGULATIONS, "DIAGNOSTIC X-RAY SYSTEMS AND THEIR MAJOR COMPONENTS", AND THE NATIONAL COUNCIL ON RADIATION PROTECTION (NCRP) NO. 102, "MEDICAL X-RAY AND GAMMA-RAY PROTECTION FOR ENERGIES UP TO 10 MEV-EQUIPMENT DESIGN AND USE", AS REVISED OR REPLACED IN THE FUTURE.

THOSE RESPONSIBLE FOR PLANNING OF X-RAY AND GAMMA-RAY EQUIPMENT INSTALLATIONS MUST BE THOROUGHLY FAMILIAR AND COMPLY COMPLETELY WITH NCRP NO. 49, "STRUCTURAL SHIELDING DESIGN AND EVALUATION FOR MEDICAL OF X-RAYS AND GAMMA-RAYS OF ENERGIES UP TO 10 MEV", AS REVISED AND REPLACED IN THE FUTURE. FAILURE TO OBSERVE THESE WARNINGS MAY CAUSE SERIOUS OR FATAL BODILY INJURIES TO THE OPERATOR OR THOSE IN THE AREA.

Symbol Descriptions

ATTENTION SYMBOL	RADIATION WARNING SYMBOL
 LASER WARNING SYMBOL	BIOHAZARD WARNING SYMBOL
 MAGNETISM WARNING SYMBOL	 PROJECTILE WARNING SYMBOL
 ELECTRICAL WARNING SYMBOL	

Safety Information

ONLY QUALIFIED AND SYSTEM TRAINED PHILIPS SERVICE STAFF IS ALLOWED TO PERFORM SERVICE (INSTALLATION, MAINTENANCE, QUALITY ASSURANCE) ON THE MX8000 SYSTEMS. MAKE SURE THAT THE LATEST VERSION OF THE SERVICE INSTRUCTIONS ARE AVAILABLE. READ THE CORRESPONDING INSTRUCTIONS CAREFULLY PRIOR TO WORKING ON THE SYSTEM. FOR YOUR OWN SAFETY AND FOR MORE DETAILED SAFETY INFORMATION, REFER ONLY TO THE CURRENT VERSION OF THE DOCUMENTS.
USE ONLY SPECIFIED TOOLS AND AUXILIARY MATERIALS.

Precautionary Measures Regarding Electrical Voltage

BEFORE YOU START THE PROCEDURE OUTLINED IN THIS MANUAL, MAKE SURE THAT YOU READ AND UNDERSTAND THE WARNINGS LISTED BELOW.

WARNING

ELECTRICAL HAZARD! PRIOR TO ANY SERVICE AND MAINTENANCE ACTIVITIES INSIDE COMPONENTS:

- **SWITCH OFF THE SYSTEM AT THE MAIN POWER SUPPLY, (USING THE ON-SITE ON-OFF SWITCH) AND THE INTERNAL/EXTERNAL UNINTERRUPTIBLE POWER SUPPLY (UPS)**
- **MAKE SURE THAT NO OTHER PERSON CAN SWITCH ON POWER OR SWITCH OFF THE SECURITY MEASURES, WHEN INSTALLATION, MAINTENANCE OR SERVICE WORK ON THE SYSTEM IS PERFORMED.**

WARNING

ELECTRICAL HAZARD! WHEN PERFORMING ANY PROCEDURE INSIDE THE PDC:

- **SWITCH OFF ALL EXTERNAL POWER, E.G. POWER FOR X-RAY WARNING LAMP.**
- **PRIOR TO ANY INTERVENTION IN THE PDC, ALLOW AT LEAST FIVE MINUTES DISCHARGE TIME AFTER THE LAST SCAN. HAZARDOUS VOLTAGE LEVELS (>500V) MAY BE PRESENT EVEN IF THE SYSTEM IS SWITCHED OFF.**

AFTER FINISHING ANY SERVICE ACTIVITY, ENSURE THAT ALL COVERS OF THE MX8000, INCLUDING THE MYLAR GASKET, ARE CLOSED.

SAFETY:

IN ADDITION TO THE WARNINGS LISTED ABOVE, MAKE SURE TO FOLLOW ALL SAFETY GUIDELINES AS DESCRIBED IN CHAPTER 1 OF THE MX8000 SYSTEMS SERVICE MANUAL. FAILURE TO DO SO CAN RESULT IN SEVERE PERSONAL INJURY.

CAUTION

ALWAYS USE AN ESD PROTECTION WRIST STRAP WHEN SERVICING ANY COMPONENT IN THE SYSTEM.

Table of Contents

Chapter 1
Introduction 1-1

Implementation Order and Time Table 1-2

Tools & Auxiliary Materials Required for Installation 1-2

Tools to Be Supplied Locally 1-2

Tools Supplied with the System 1-3

Required Tools 1-4

Pre-installation - Using Mylars to Drill Anchoring Holes 1-5

Positioning the Gantry and Couch Mylars 1-5

Drilling the Holes 1-6

Chapter 2
Safety 2-1

Changes in Delivered Products 2-1

Explanation of Symbols 2-2

General Precautions 2-2

Service Precautions 2-3

Precautions Against Mechanical Hazards 2-4

Precautions Against Electrical Hazards 2-5

Electrical Installations 2-5

Installation of Electromedical Systems and Equipment 2-5

Protection of Electrostatically Sensitive Devices 2-7

Laser Radiation 2-8

Batteries 2-8

Handling Heavy Loads 2-8

Handling Hazardous Substances 2-8

System Specific Safety Precautions 2-9

Working with System Components 2-9

Laser Products 2-12

Attaching Screws and Nuts 2-14

Using LOCTITE 2-16

Warning Labels 2-18

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Chapter 3
Site Inspection Check List & Layout Information 3-1

Site Inspection Check List 3-2
Delivery Route 3-3
Scan (Examination) Room 3-4
Utility Room 3-5
Control Room 3-6
Site Layout Information 3-7
General 3-7
Scanning Room 3-10
Utility Room 3-13
Control Room 3-13
Patient Preparation Area 3-14

Chapter 4
Unpacking & Transporting System Units..... 4-1

Packing List 4-2
The Gantry 4-3
Unpacking the Gantry 4-3
Transporting the Gantry 4-9
Transport Dimensions 4-9
Removal and Installation of the Gantry Front Cover 4-10
Removal and Installation of the Gantry Bottom Cover 4-13
Transport Weights 4-14
Normal Transport 4-14
Transport though Narrow Spaces 4-15
Transport through Doors and Hallways 4-16
The Patient Table 4-18
Unpacking the Patient Table 4-18
Transporting the Patient Table 4-20
Power Distribution Cabinet (PDC) 4-22
Heat Exchangers - Water-Water & Water-Air 4-24
The Operating Console 4-26
The Computer Rack 4-27

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Chapter 5
Positioning and Anchoring System Units 5-1

Positioning the Gantry 5-2
Anchoring the Gantry 5-3
Bolting the Gantry to the Floor 5-5

Anchoring the Patient Table 5-7
Installing the Connection Piece 5-7
Removing the Patient Table Transport Brackets 5-8
Marking the Anchoring Holes for the Patient Table 5-13
Drilling the Holes 5-16
Installing the Anchors 5-17
Positioning the Patient Table 5-17
Removing the Transport Rollers 5-19
Bolting the Patient Table to the Floor 5-19
Installing the Fuse Panel and the Service Switch Panel 5-21

Anchoring Secondary System Components 5-24
Anchoring the PDC and the Heat Exchanger 5-24
Drilling the Anchor Holes 5-27
Installing the Anchors 5-27
Anchoring the PDC and Heat Exchanger 5-27

Anchoring the Operating Console 5-28

Chapter 6
Connecting System Components..... 6-1

Connecting the Coolant System 6-1

Connecting the Air Hoses (Water-Air Heat Exchanger Only) 6-7

Filling the Water System 6-9
Water-Water Heat Exchanger 6-9
Water-Air Heat Exchanger 6-13

Electrical Connections 6-15
Routing the Cables 6-15
Connecting the PDC 6-19
Connecting the Gantry 6-23
Connecting the Patient Table 6-29
Connecting the Heat Exchangers (Water-Water and Water-Air) 6-30

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Connecting the Operating Station 6-33

Chapter 7
Start-up Sequence 7-1

Removing the Gantry Transport Locking Screws 7-1

Checking the Rotor 7-5

Adapting Line Voltages 7-6

Main Transformer T1 Line Voltage Adaptation 7-16

System Line Frequency Adaptation 7-17

Checking the Protective Conductors 7-18

Connecting to Power and Ground Points 7-18

Chapter 8
First Time System Operation 8-1

Safety Measures 8-1

Checking the Emergency Shutdown Buttons 8-1

Protection Kit Functionality Test (Only For systems equipped with the PDC Auto Transformer Protection Kit) 8-2

System Turn-on Sequence 8-3

Checking the Power Supply 8-3

Circuit Breakers 8-4

Checking LEDs in the Gantry 8-6

Checking Movement from the Gantry Panel 8-8

Checking Movement from the Scan Control Unit 8-9

Gantry Safety Checks 8-9

Long TC 8-13

Final Patient Table Alignment 8-13

Adjustment of the Cover Laser Light Markers 8-14

Chapter 9
Completing the Installation 9-1

Closing System Covers 9-1

Covers in the Left Leg of the Gantry 9-1

Connection Piece 9-1

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Upper and Lower Gantry Leg Covers 9-2
Patient Table Covers 9-3
Installing the Mylar Gasket 9-5
Closing the Duct Covers 9-7

License Key Installation 9-7
Entering Service (IRS) Diagnostic Key 9-7
ETL Label (for Canada Only) 9-8

Scan Test 9-9

Installing the Network 9-10

Mx8000 Network Configuration 9-11
Network Configuration Terminology 9-12
Using Configuration Dialog Boxes 9-14
Setting the IP Address 9-15
Configuring the System 9-16
Screen Examples for Different Network Configurations 9-22

Chapter 10
Acceptance Test & Installation Report 10-1

Preface 10-1

Air Calibrations 10-1

Acceptance Test 10-2
Delivery and Installation Report 10-2

Delivery and Installation Report 10-3

Test Equipment 10-5

Certified Components 10-5

Appendix A
Electrical Line Inspection

Test Preparation A-3

Checking the Line Impedance L–L A-4

Checking the Impedance Between Line–Neutral A-4

Checking the Impedance Between L–GND A-4

Checking the Impedance Between Neutral –GND A-4

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Checking the Resistance Between PE-Component GND A-5

Nominal Line Parameters—Distribution Panel A-6

Measured Values on TEAL (PLC)/WDC Input A-7

Corrective Action A-9

Measured Values on PDC Input A-10

Corrective Action A-13

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Preface

Our goal is to give complete satisfaction to the customer, and every department contributes to this goal. Successful installation depends on the active cooperation of all company departments.

Customers select our products because they are convinced that these products will satisfy their needs. Their continued satisfaction depends on how well we, as service providers, do our jobs.

During site planning and equipment delivery, the enthusiasm of the customer is at its peak. Successful installation keeps customer enthusiasm high and demonstrates to customers (present and future) a well-managed and professional high-technology organization. To ensure smooth installation, *Chapter 1* of this manual summarizes the contents of this manual, and describes an estimated time schedule and the material requirements.

Product installation is only one part of a well organized process designed to keep our customers happy to work with our company.

! SAFETY

SAFETY: *Chapter 2* provides important safety information. Read all of this information very carefully. This knowledge could save lives.

⚠ CAUTION

CAUTION! Some systems that are delivered may require software or hardware upgrades. During the installation procedure, **do not perform any hardware or software upgrades other than those required by mandatory letters**. Run the system in different scan modes under clinical conditions for a few days to check proper system functioning before performing software or hardware upgrades.

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Chapter 1
Introduction

This manual defines the installation procedures applied to the Mx8000 Quad and Mx8000 Dual systems.

The term Mx8000 in this document refers to both Mx8000 Quad and Mx8000 Dual systems. Any difference in procedure for each system will be noted in the manual.

How this Manual is Organized

This Installation Manual provides all the information required for installing the Mx8000. It is organized as follows:

- The current chapter includes an estimated time table for installation, and describes the tools and materials required. It also describes some recommended pre-installation activities, such as drilling anchoring holes for the Gantry using the Mylar.
- The chapter on Safety (*Chapter 2: Safety*) is essential reading. Read and follow these safety procedures carefully.
- *Chapter 3: Site Inspection Check List & Layout Information* provides a Site Inspection Checklist, which must be completed one week before the planned delivery date. It also provides site layout information.
- *Chapter 4: Unpacking & Transporting System Units* and *Chapter 5: Positioning and Anchoring System Units* describe the correct way to unpack, position and bolt the system components.
- *Chapter 6: Connecting System Components* explains how to connect the system to water and electrical resources.
- After everything is in place and connected, before beginning operation, follow the start-up sequence provided in *Chapter 7: Start-up Sequence*.
- *Chapter 8: First Time System Operation* specifies steps to follow before first time system operation.
- To complete installation, follow the procedures described in *Chapter 9: Completing the Installation*.
- If you are not in the U.S.A., perform the Acceptance Tests and complete the Installation Report in *Chapter 10: Acceptance Test & Installation Report* now. Otherwise, run the CDRH tests described in *Chapter 11: CDRH Tests (U.S.A. Only)* first.
- If you are in the U.S.A., you must run the CDRH tests described in *Chapter 11: CDRH Tests (U.S.A. Only)* before running the acceptance tests and

completing the Installation Report provided in *Chapter 10: Acceptance Test & Installation Report*.

- *Appendix A: Electrical Line Inspection* outlines all the necessary checks to evaluate the behavior of the electrical line to the system.

Implementation Order and Time Table

It is most important to perform the pre-installation and installation tasks in the order shown in *Table 1-1*. Estimated time for each installation operation is included. The total estimated time (not including pre-installation tasks) is three days.

Table 1-1. Order of Tasks and Estimated Time Required

Number	Activity	Estimated Time
1	Completing site preparation and Site Inspection checklist.	Pre-installation
2	Drilling holes using the Mylar.	Pre-installation
3	Unpacking and positioning units.	Half a day *
4	Anchoring units.	Half a day *
5	Connecting system components.	One day *
6	Preparing the system for operation.	Half a day *
7	System first time operation and functional checks.	Half a day *
8	Preparing system for clinical operation.	One day *

* *The estimated time assumes that in each day two people work for at least 12 hours.*

Tools & Auxiliary Materials Required for Installation

Some tools and auxiliary materials required for transporting and installing the system must be supplied by the local office, and some are supplied with the system.

Tools to Be Supplied Locally

The following must be supplied by the local office:

- Transport Device for the Gantry P/N BR71800017A
- Gantry lifting device (if needed) P/N 479-7181-4109
- Protective earth (PE) resistance tester
- Power line impedance meter
- Phase sequence meter

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- 1/2" square drive ratchet, with 5" and 8" extensions
- 1/2" square drive Allen sockets, 3-14 mm
- 1/2" square drive Hex sockets, 6-18 mm
- 25-130 Nm torque wrench with 1/2" drive
- Fork wrenches, sizes 27, 32, 36 and 41
- Allen keys, sizes 1.5-10 mm (check that the 2.5 mm key is included)
- Fork wrenches, sizes 5 mm and 17 mm
- Crimper (WAGO item number 206-216, or equivalent)
- Hot air blower
- Cable ties
- Electric hammer drill
- 6 mm and 10 mm Ø drill bits for drilling through concrete
- Vacuum cleaner
- Hammer
- Level
- Crowbar
- Marking tool
- Marking pen
- Two flexible water hoses, diameter 1/2" (both long enough to reach the nearest water supply - drinking water quality, and drainage) and an adaptor to enable connection to the water supply
- Two 1/2" clamps
- Standard working tool kit, including at least a set of flat screwdrivers, a set of Philips screwdrivers, a cable stripping knife, a cutter, a standard pliers, a long nose pliers, a digital multi meter, an iron saw and a tape measure
- Laptop computer with advanced diagnostic software

Tools Supplied with the System

The following are delivered with the system:

- Transport rollers for the Patient Table
- 14 mm Ø drill bit for anchoring the Patient Table
- 16mm Ø drill bit for anchoring the Gantry
- Anchors and screws for bolting the Gantry and Patient Table (no anchors are supplied for the Cabinets and Operating Station)
- Punch for Patient Table and Gantry anchors

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- Water pressure gauge
- Four metal pins (to enable easier positioning of the Gantry)
- Gantry and Couch Mylar template

Required Tools

You will need the following to drill anchoring holes with the Mylars:

- Two Mylar templates for the Gantry and the Couch, P/N 705-7180-2712
- Marking tool
- Vacuum cleaner
- Marking pen
- Electric hammer drill
- 6 mm Ø drill bit
- 10 mm Ø drill bit
- 16 mm Ø drill bit
- Set of standard tools

Table 1-2. Drill & Anchor Kit P/N 407-7180-5302

Part	Qty
Anchor M10x8.0	4
Hammer drill bit	1
Tool F/Anchor M10	1
Scrap M10x0.75 12.9	4
Flat Washer10 mm STL	4
Spring Washer 10 mm STL	4
Control Tool	1
Positioning pin	4
Site Preparation (Gantry & Couch Mylars)	1
Anchor Insta. pipe	1

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Pre-installation - Using Mylars to Drill Anchoring Holes

Before the planned delivery date, you must prepare the site and check it as described in detail in *Chapter 3: Site Inspection Check List & Layout Information*. In addition, to shorten the time required for the actual installation, we strongly recommend that you prepare anchoring holes for the Gantry as described in this section. Use the Mylar templates provided to mark the points at which the Gantry and the Couch will be connected to the floor.

Another procedure for marking holes for the Couch is described in *Chapter 5: Positioning and Anchoring System Units*.

Positioning the Gantry and Couch Mylars

To ensure that you drill the holes in the right places, position the Mylars as follows:

1. Position the Gantry Mylar template so that the duct markings on the Mylar exactly overlay the actual ducts in the floor. Then use adhesive tape to stick it to the floor.
2. Position the Couch Mylar template so that it is perpendicular to the Gantry Mylar. Attach the Couch Mylar to the Gantry Mylar with adhesive tape

NOTE

Make sure that the Mylars are flat on the floor before marking the holes. Measure the diagonals to verify that the Mylars are flat and taut.

3. Mark the positions of the drilling holes by making a small hole with a marking tool and a hammer.
4. Remove the Mylars.
5. Draw a circle around each hole with a marking pen.

Drilling the Holes

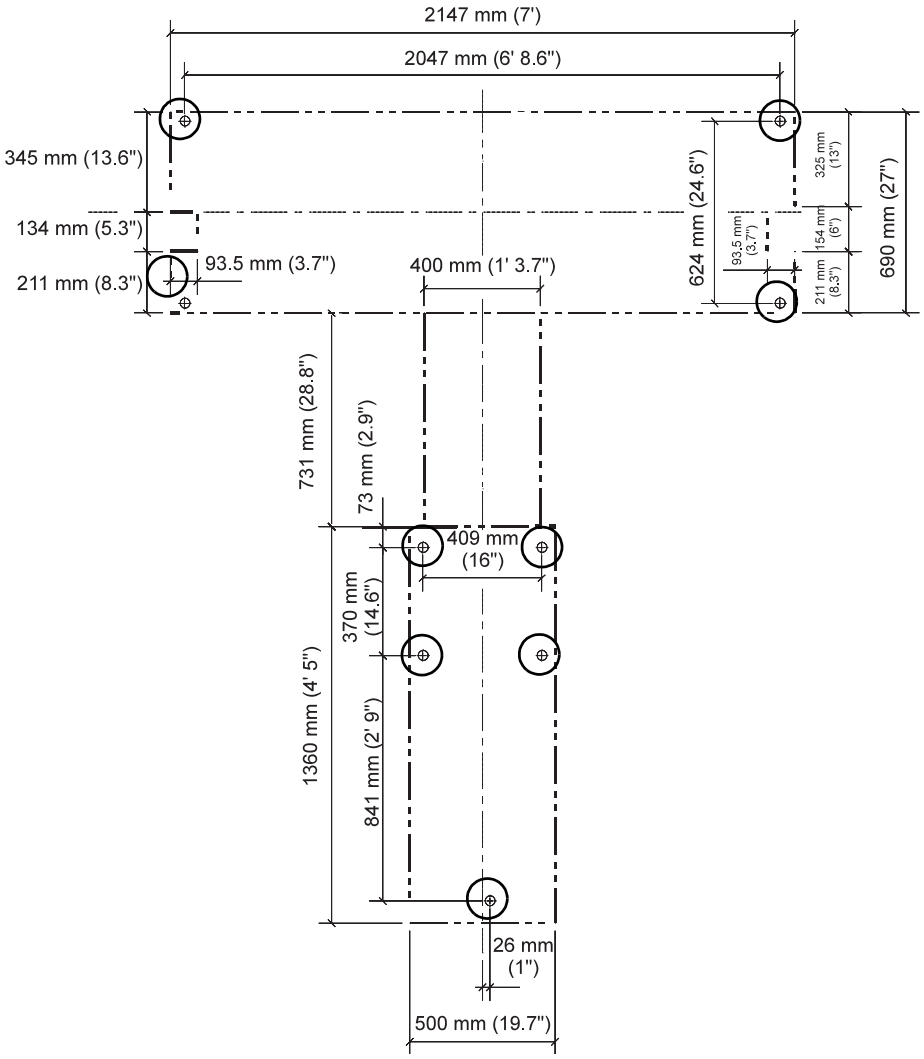

Figure 1-1: Footprint of the Mx8000

NOTE

It is extremely important to drill the holes in the exact positions where they are marked. If you do not, it will be difficult to position the Gantry and the Couch.

Drilling Holes for the Gantry

1. Drill all four holes marked to a depth of 80 mm using the 6 mm drill bit.
2. Widen the holes using the 10 mm drill bit.
3. Drill the holes to a depth of 93 mm (max 95 mm) using the 16mm drill bit supplied.
4. Vacuum the dust from inside and around the holes, and from the surrounding area. The holes and surrounding area must be as free of dust as possible.

Drilling Holes for the Couch

1. Drill all five holes marked to a depth of 80 mm using the 6 mm drill bit.
2. Widen the holes using the 10 mm drill bit.
3. Drill the holes to a depth of 93 mm (max 95 mm) using the 14mm drill bit supplied.
4. Vacuum the dust from inside and around the holes, and from the surrounding area. The holes and surrounding area must be as free of dust as possible.

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Chapter 2
Safety

This chapter describes safety precautions and procedures that will ensure the safety of everyone during servicing and operation of the Mx8000 system and includes the following sections:

- General precautions to be observed at all times
- Service precautions to be observed primarily when the equipment is serviced
- Description of the warning labels

! SAFETY

SAFETY: These general safety guidelines supplement specific safety instructions in other documents, e.g., product documents, as well as instructions from superiors.

In addition, the system must comply with all country specific requirements (e.g., occupational safety and accident prevention regulations).

It is mandatory to observe all safety instructions in the performance of work and tests.

Left and right references are from the point of view of a person standing at the open end of the Patient Table, facing the Gantry (see *Figure 2-1*).

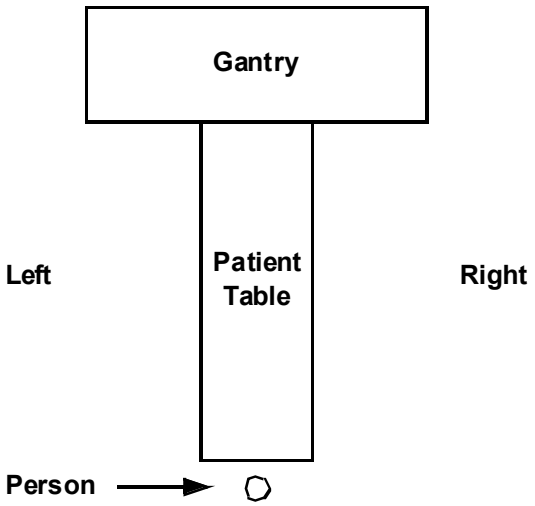

Figure 2-1:

Changes in Delivered Products

Do not implement changes in delivered products without permission granted by the responsible departments of the plant.

This regulation applies particularly to changes which may affect the mechanical and/or electrical safety or radiation-protection properties of a product (e.g., changing safety distances, removing locks/instructions, enlarging the radiation-exit window on the lead cone, etc.)

Explanation of Symbols

The following symbols are used in the technical documents:

Measuring and adjusting work on parts which are under a voltage of >50 VAC or >120 DC.

Activities with radiation switched ON.

Safety-relevant screw connections.

Use only the (supplied) screw connections that are suitable for the intended purpose and tighten with the specified torque.

General Precautions

This product was designed and manufactured to ensure maximum safety of operation and service. It should be installed, maintained, and serviced in strict compliance with the safety instructions contained herein.

1. No changes, additions, or removal of any system accessories are permitted without the prior written approval of a local service manager.
2. Connect the product to the mains according to the wiring scheme in this manual.
3. Before beginning any clinical use, complete all safety checks in this manual.
4. Do not leave problems unsolved that may affect the safety of the product. In case of doubt concerning the system's safe operation, call the service manager for further instruction.
5. Do not allow unauthorized personnel access to the system. Only properly trained and fully qualified personnel are authorized to install and operate this equipment.

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Service Precautions

Safety precautions must be taken before servicing the machine. It is the ***responsibility of the service engineer*** to ensure that these precautions are taken to avoid any hazard.

There are three different kinds of potential hazard when servicing an instrument like the Mx8000:

- Mechanical hazards
- Electrical hazards
- Radiation Hazards

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Precautions Against Mechanical Hazards

WARNING

Rotating machinery— never service the rotating frame when or if rotational movement is enabled. Failure to comply may result in equipment damage, serious injury or death to service personnel.

The following precautions prevent mechanical hazards:

1. The Rotor of the Mx8000 contains heavy parts, such as the High Voltage Power Supply, DMS, etc., and is perfectly balanced. When you disturb this balance by removing a part from it, it will start an uncontrolled mechanical motion to reach a new equilibrium point. This motion cannot be stopped and may injure the service engineer.

   Therefore, ***if you intend to remove a unit, proceed as follows:***

   a. Bring the Rotor to the position in which the unit can be removed.

   b. When the Rotor is not rotating, engage the rotor locking device (located on the front side of the Gantry at the 2 o'clock position).

   c. Do not release the rotor locking device until the unit (or its replacement) is returned and fixed securely to the Rotor.

2. In its idle state, the Mx8000 rotates most of the time; consider all units mounted on the rotor as ***flying*** units. If you fail to fasten units to the Rotor securely or leave loose screws, units may detach from the Rotor and cause serious injury.

   After servicing any unit, verify that all units and screws are attached securely in their correct places.

3. The Rotor has no fixed idle position, and even when it is not generating X-Rays it may start rotating. An uncontrolled, electricity-driven rotation may cause serious injuries. For this reason, two microswitches in the front cover disable rotation each time the front cover is opened. In addition, another switch (S301) on the inner left side of the Gantry also disables rotation.

   Do not bypass the two front cover switches unless no person is near the Gantry, and it is absolutely necessary.

Never approach the Gantry when or if rotational movement is enabled.

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Precautions Against Electrical Hazards

The following precautions prevent electrical hazards:

1. Being a continuous rotating scanner means that the power is transmitted to the rotating part by mechanical slip rings. Over the slip rings there are ***line voltages***. Once you remove the rear cover, you may be in contact with line voltages.

CAUTION

Front end electronics is energized through the ***slip rings*** even when you switch off the system.
Therefore, before you remove the rear cover, to avoid any electrical danger, switch off all circuit breakers on the Power Distribution Cabinet (PDC), and on the main power supply to the Mx8000.

2. The Computer Rack and the Operating Console receive power from an Uninterruptible Power Supply (UPS) located in the Power Distribution Cabinet (PDC). This means that parts inside these units continue to receive line voltages, even after the console or the various circuit breakers are switched off.

   Disconnect the Rack and Console power cables before accessing these units.

3. Line voltages are always present in the Gantry's left leg. Therefore, make sure that the left leg cover is always closed, unless otherwise necessary for service.
4. Remember that the PDC is energized even when the system is OFF. Therefore, always keep the door of the PDC closed. When you must service the PDC, first disconnect the power supply.

The system has large capacitors. Therefore, wait for a few minutes after disconnecting the power to the system before servicing the high voltage (HV) system on the Rotor and in the PDC.

Electrical Installations

Electrical installations of medically used rooms must comply with the requirements of each country. Follow the regulations from the installation sheets for the specific project.

Installation of Electromedical Systems and Equipment

All work must be carried out in accordance with the technical documentation.

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Make sure that all protective ground wires provided by the manufacturer are connected properly before powering the equipment. This applies, for example, to all metallic covers which may develop a dangerous contact voltage in case of a fault. They must always be connected to the protective ground wire. To ensure this, the connection between these covers and the protective ground wire must be made with screws and contact washer or via the protective ground wires provided.

Means "**Terminal for connection of equipment protective ground wire**".

The protective ground wires must be connected between the system components and the power supply as shown in the wiring diagram.

In the interest of protection for our personnel, the protective ground wires must be installed prior to first switching on the product/system, as well as after completing all work, before turnover to the customer, in accordance with the product documentation.

Personal Protection Measures (Occupational Safety)

The legally relevant and internal regulations and specifications concerning protection of labor and accident prevention must be observed, primarily in the interest of the persons performing the work. The notes below are given as additional information.

Working When Connected to Voltages

Do not perform any work on current-carrying parts (>50 V ~ or 120 V).

Turn OFF energy to the system by means of the EMERGENCY OFF switch.

This prohibition does not apply for measuring and adjustment procedures. Be careful when performing these procedures. Use only tools and measuring instruments which are suitable for the respective procedure.

Test and adjustment points must be accessible without any risk of injury to the personnel. If this is not possible, switch OFF the system.

If voltage must be applied during an operation, e.g., to perform unit movements, take every precaution especially when working with moving and rotating parts. Turn OFF energy to the unit immediately afterwards.

⚠ WARNING

When performing work within the danger area of products, any involuntary unit movements must be prevented by previously actuating the service switch or the EMERGENCY STOP button.

Body Protectors

If there is any risk of injury, use body protectors. It is essential to take the protective measures described in the documentation.

Radiation Protection

Ionizing radiation can lead to radiation injuries, if handled incorrectly. When radiation is applied, comply with the require protective measures at all times.

WARNING

Blood-borne Pathogens

When handling parts that may have come into contact with patients, take appropriate precautions against exposure to blood-borne pathogens

Mandatory Reporting

Notify the supervisor in charge, at once, in the event of an accident or if there are any hazards that may cause an accident.

Instruments used for PM

Never use worn or defective instrument

Using the Right Torque for Screw Connections

Tighten all existing screw connections firmly, but not so that they are overstressed (see *Section Attaching Screws and Nuts on page 14*).

CAUTION

- Use torque wrenches that overgo periodic checks and calibrations and that are within the period of certified validity.
- Use only the indicated torque at all times.
- Secure all screws in accordance with the corresponding data.
- If LOCTITE must be used to secure screws, it is stated in the text.

Protection of Electrostatically Sensitive Devices

Integrated circuits and PC boards that are equipped with electronic modules require special careful handling, because of their electrostatic sensitive structures and their extremely high input impedances.

Use the indicated means of protection.

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Laser Radiation

Laser radiation can lead to eye and skin injuries (Class 3b and Class 4). Note the relevant instructions in the documentation.

Batteries

For replacement of batteries, special preventive measures apply. With lithium batteries, there is a risk of explosion if they are incorrectly installed. Observe the notes concerning handling and disposal in each case.

Handling Heavy Loads

In addition to wearing the required protective clothing, e.g., safety boots and gloves, take care that heavy loads are correctly lifted or carried to avoid any physical injury (e.g., injuring the spine).

The relevant instructions must be complied with.

Move heavy or awkward loads by mechanical means or using several persons.

Handling Hazardous Substances

A hazardous substance is any material that can ignite or explode, or that is toxic, injurious to health, corrosive or irritating.

The properties of hazardous substances, together with the hazards and protective measures connected with them, are identified clearly by symbols and handling instructions attached to them.

Before handling them, read these instructions and take the required protective measures to avoid health risks during work.

Comply with all relevant instructions in the documentation.

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System Specific Safety Precautions

WARNING

When you must handle parts that may have come into contact with patients, take appropriate precautions to prevent exposure to blood-born pathogens.

Working with System Components

Gantry

Before beginning any operations on the Gantry, do the following:

1. Wait until rotation has completely stopped.
2. Disable Gantry rotation. For this purpose, set switch S301 into the Gantry (left, below) to position 0.

ALERT

ALERT! Turn the power OFF from the main hospital breaker.

3. Connect the rotating and the stationary parts of the Gantry with a protective conductor, e.g., cable 4665329 B1945. When you are finished working, remove the protective conductor.

Hazardous voltage levels (560 VDC) may be present, even if the system is switched OFF. Take the following precautionary measures regarding hazardous electrical voltages:

- Keep the back of the Gantry closed.
- ***Do not*** touch the power slip rings or the carbon brush holders on the back of the Gantry.

Safety Precautions Before Opening the Gantry Back Cover

WARNING

- The system has to be switched off completely using the on-site ON/OFF switch before any work is done in the gantry.
- Remove Fuses F100, F200 in the PDC.
- Make sure that the system is secured against accidental switch on!

Before working on the Slip Ring part, wait until the capacitor bank is discharged (at least five minutes)! Check the two yellow LED's on D450 inside the PCD unit.

- DCC Power D450
- Slip Rings
- Carbon Brushes
- Generator Electronics
- PSS Gantry (Measure the voltage level at X303.)

WARNING

To assure that the capacitor bank is discharged, you can measure the UDC voltage on the following points:
UDC_pos and UDC_neg on D450 inside the PDC unit
UDC_pos and UDC_neg on right Gantry stand
UDC_pos and UDC_neg on Slip Ring Gantry rear side
UDC_pos and UDC_neg on generator electronic box

Scan Unit

Observe the following protective measures when working on the scan unit with radiation ON:

- Use a radiation shield.
- Maintain a safe distance from the source.
- Use the minimum dose and the smallest slice thickness.
- Remove the phantom, if possible.

Generator Cabinet

CAUTION

Replace printed circuit boards if components soldered onto the board, including fuses, are defective.

Couch

WARNING

Point of injury! The sharp edges of the elevator arms may cause injury. Use protection when working on the Couch.

Install both edge protectors (*Figure 2-2*) at the location indicated (arrows in *Figure 2-3*) before beginning any work on the Couch.

NOTE

The two foam edge protectors are included in the system delivery volume.

Remove both foam edge protectors after completing work on the Couch.

Store the foam edge protectors with the auxiliary service devices for the system.

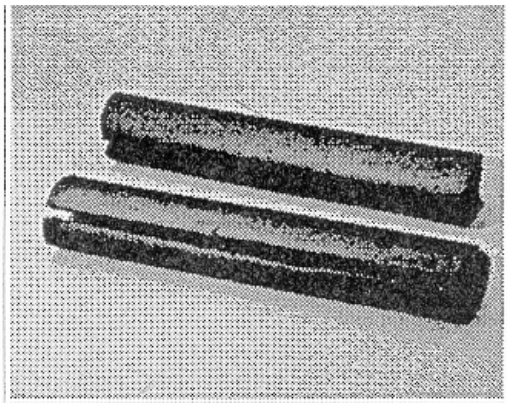

Figure 2-2: Foam Edge Protectors

Figure 2-3: Edge Protectors Installed

Laser Products

Do not operate laser products without the appropriate housing.

Only trained personnel may handle lasers. When working with lasers, observe all legal and product specific regulations (T1 242).

Do not look directly into a laser beam or at its reflection on smooth, mirror-like surfaces.

Non-compliance with legal regulations can lead to bodily injury due to the hazardous effects of the laser beam.

Optical Disk

To ensure the reliability of the safety configuration integrated into the drive, only qualified service and maintenance personnel may install or maintain the equipment.

The use of parts is limited to original spare parts.

Work with respect to the optical disk may be performed only in compliance with the manufacturer's instructions.

Observe the warning labels.

Do not remove Warning labels at any time (see *Figure 2-4*).

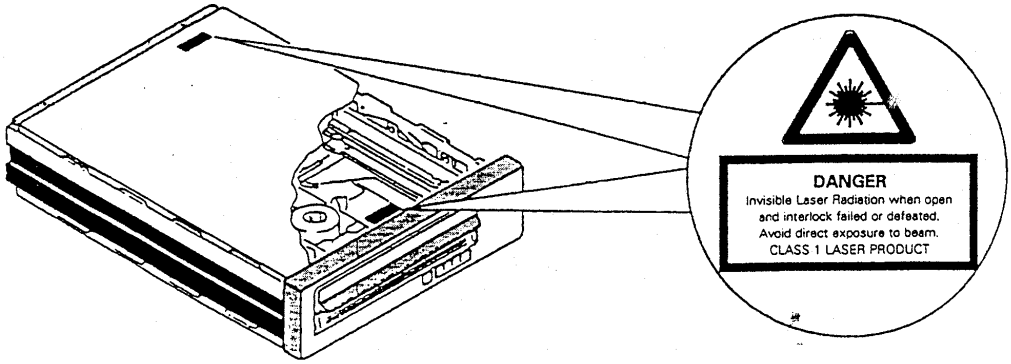
DANGER
Invisible Laser Radiation when open
and interlock failed or defeated.
Avoid direct exposure to beam.
CLASS 1 LASER PRODUCT

Figure 2-4: Label

Light Markers

WARNING

Laser Radiation - DO NOT STARE INTO BEAM.

Specification for Laser Type FP - 67/ 1LF (LASER COMPONENTS GmbH):

- Output power <1mW
- Wave length 670 nm
- Classification according to DHHS regulations 21 CFR Chap. J / DIN VDE 0837: Class 2 Laser Product

Attaching Screws and Nuts

CAUTION

For safety reasons, secure screw connections with a torque wrench using the correct torque (Nm).

The torques for safety-relevant screw connections are listed in *Table 2-1*.

When replacing screws and washers, use only identical parts.

Fasten all screws and nuts of the Gantry with the torque values specified in *Table 2-1 "Screws Used on Mx8000 Units" on page 2-15*, except screws up to M3, slotted screws and Phillips head screws, which are tightened with the appropriate wrench and not with a torque wrench.

Tighten all screws and nuts on the rotating parts of the Gantry, except self-locking nuts, safety screws and safety nuts, with LOCTITE (see also, *"Using LOCTITE" on page 2-16*).

For more details, refer to the instructions for replacing parts.

Do not loosen or tighten safety screws and safety nuts (screws and nuts with grooves on the underside of the screw head) more than five times.

Clean dirty grooves of safety screws or safety nuts with a wire brush.

Do not use a washer several times. After loosening the screw or nut, change the washer.

Do not attempt to use torque wrenches to exceed the specified torque. When the specified torque is reached, there is a clearly audible and perceptible sound and sign. Tightening the screw or nut beyond that point may destroy the screw or nut and the torque wrench. If you suspect that a screw or nut was tightened too much, change the screw or nut.

If a torque wrench has been stressed beyond a specified value, the range of the torque wrench may be corrupted. In this case, check the torque wrench and adjust it, if necessary.

When not in use, leave the torque wrench at the low setting. After prolonged non-use or storage, run the torque wrench repeatedly with a low torque; this lubricates the moving parts and improves its accuracy.

Check all torque wrenches used on Mx8000 units at regular intervals.

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Table 2-1 lists nominal tightening torques in Nm and wrench sizes in mm for screws and nuts with metric threads used on Mx8000 units.

Table 2-1. Tightening Torques for Screws Connections

	Strength Class 8.8						Strength Class 100					
	Hexagon socket head screw 1 in *Figure 2-5*		Hexagon socket countersunk screw 2 in *Figure 2-5*		Hexagon head screw & nut, hexagon nut with plastic insert 3 in *Figure 2-5*		Safety hexagon socket head screw 4 in *Figure 2-5*		Safety hexagon head screw & nut 5 in *Figure 2-5*		Threaded pin 6 in *Figure 2-5*	
Nominal thread diameter	tightening torque Nm	wrench size mm	tightening torque Nm	wrench size mm	tightening torque Nm	wrench size mm	tightening torque Nm	wrench size mm	tightening torque Nm	wrench size mm	tightening torque Nm	wrench size mm
M3	1.3	2.5	1.3	2.0	1.3	5.5	-	-	-	-	0.8	1.5
M4	3.0	3.0	3.0	2.5	3.0	7.0	-	-	-	-	2.0	2.0
M5	6.0	4.0	6.0	3.0	6.0	8.0	10.0	4.0	9.0	8.0	3.7	2.5
M6	10.2	5.0	10.2	4.0	10.2	10.0	19.0	5.0	16.0	10.0	6.5	3.0
M8	25.3	6.0	25.3	5.0	25.3	13.0	39.0	6.0	35.0	13.0	16.0	4.0
M10	49.8	8.0	49.8	6.0	49.8	17.0	80.0	8.0	75.0	15.0	30.0	5.0
M12	87.6	10.0	87.6	8.0	87.6	19.0	120.0	10.0	115.0	17.0	-	-

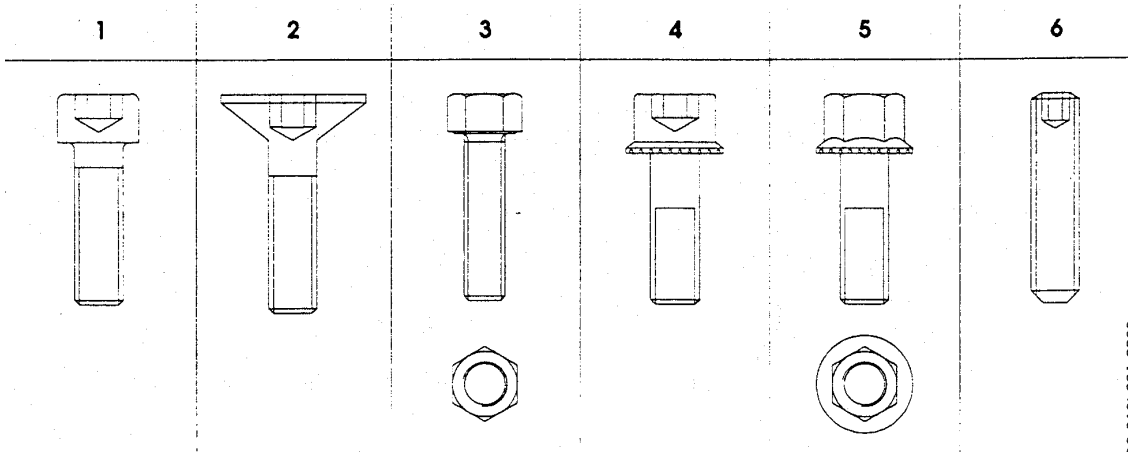

Figure 2-5: Screws Used on Mx8000 Units

Using LOCTITE

All screws and nuts on the rotating part of the Gantry must be secured with LOCTITE, except safety screws and safety nuts, which are secured without LOCTITE.

CAUTION

For safety reasons, secure screw connections with a torque wrench using the correct torque (Nm).

The torques for safety-relevant screw connections are listed in *Table 2-1*.

When replacing screws and washers, use only identical parts.

You will need the following two LOCTITE types:

- For all screws up to type M3, as well as all slotted and Phillips head screws, use LOCTITE No.222 to create connections that are lightly tightened and easily loosened.
- For all screws not listed for LOCTITE No. 222, use LOCTITE No. 242 or 243 (preferable) to create connections that are moderately tightened, but can still be loosened.

Loctite Number	PHILIPS P/N
222	CH040100010
242, 243	CH040100012

All parts that come into contact with LOCTITE must be clean and free of grease.

Apply a few drops of LOCTITE to the screw or to the first few threads of nut threading before inserting and turning the screw or nut in place, so that LOCTITE fills the threading when the screw or nut is completely secured. Apply LOCTITE sparingly.

Since LOCTITE remains fluid on contact with air over a long time, any excess can easily be wiped away later.

NOTE

On contact with air, LOCTITE hardens slowly. On contact with metals, it hardens only through catalysis. Salt crystals will form. They cause no damage and are non-corrosive.

When using LOCTITE, take the following protective measures:

- Protect wounds to prevent contact with LOCTITE. LOCTITE is non-toxic. However, prolonged contact with the skin can cause irritations to the skin and slow the healing process.
- If LOCTITE splashes into the eye, rinse immediately with tap water or boric acid solution. Where contact with the skin cannot be avoided, use paper tissues to wipe away the LOCTITE.
- After applying LOCTITE, wash hands with soap and water. Do not use any other cleaning agent to clean your hands.

LOCTITE can be stored for at least one year at room temperature. Close the bottle when not in use.

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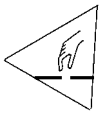
Warning Labels

This section lists the warning labels that are on the Gantry and Patient Table.

Label	Location of Label
ATTENTION! POWER IS SUPPLIED TO THESE PARTS EVEN IF UNIT IS TURNED OFF. 705-7180-1409	On the right leg. Visible when cover is open.
WARNING! FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE FUSES WITH THE SAME TYPE AND RATING ONLY.	On the Rotor. Visible when cover is open.
ATTENTION ESD OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICE. 705-7180-2100	On the Gantry. Visible when cover is open.
 ATTENTION Do not place any objects on this surface. 705-7180-2308	On the Patient Table, on the stretcher facing the Gantry and on the front door of the PDC.

Label	Location of Label
 CAUTION! ROTATING PARTS! SET SWITCH S301 TO ZERO BEFORE ANY WORK. 705-7180-1300	On the Rotor. Visible when cover is open.
RISK OF ELECTRIC SHOCK **WARNING!** CAPACITORS REMAIN CHARGED TO DANGEROUS VOLTAGES DISCHARGE TIME 5 MINS	On the base of the Patient Table, visible when the cover of the bed is open. On the left leg, visible when the cover is open.
	On the left leg. Visible when the cover is open.
 CAUTION! Static Sensitive Do Not Handle Unless Wrist Strap is Worn. 705-7170-3613	On the front of the Rotor, on the front-end electronics (F.E.E.). Visible when the cover is open.

Label	Location of Label
WARNING! OIL CONNECTIONS ARE SENSITIVE MECHANICALLY. DO NOT USE THEM AS HANDLES.	On the X-ray tube.
Caution! Electric shock hazard. Switch off the power before any work. 705-7180-2209	On the front and rear sides of the Gantry where the slip ring is placed. Visible when the cover is open.
Caution! To reduce the risk of electric shock, do not remove this panel until 2 minutes have elapsed after turning off equipment.	On the Power Distribution Cabinet (PDC), and on the High Voltage (HV) unit of the Gantry.

Chapter 3
Site Inspection Check List & Layout Information

This chapter includes a check list that you should complete one week before the planned delivery date.

In addition, it provides site layout information that you should review to make sure that the site environment is ready for the new equipment. This section also includes diagrams and the dimensions of the equipment.

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Site Inspection Check List

SITE INSPECTION CHECK LIST
Mx8000

This Check List is to be completed in conjunction with the Site Preparation Guidelines and site specific drawings.

In case information is inconsistent, please consult Service Engineering in Haifa.

This Check List is to be completed one week prior to the planned delivery date and sent by fax to the local PHILIPS Service office.

Site Name: _____

Site Address: _____

Phone Number: _____

Customer Representative: _____

Person performing Inspection: _____

Subsidiary: _____

Date: ____ _____

Delivery Route

Ground Delivery _____ Loading Dock _____

Special equipment that may be required for delivery_____

Floor type throughout the delivery route _____

Is floor protection required? No ☐ Yes ☐

Is the use of elevator required? No ☐ Yes ☐

If yes, what is elevator capacity? _____ kg

NOTE

The Gantry of the Mx8000 requires an elevator capacity of 2600 Kg (6000 lbs). If this capacity is not available, special rigging must be arranged.

Structural engineering certificate for delivery route and exam room granted?
No ☐ Yes ☐

Elevator inside dimensions _____W _____H _____D

Elevator door opening _____W _____H

Will elevator technician be present during delivery? No ☐ Yes ☐

Are the following available:Mx8000 delivery kit? No ☐ Yes ☐

Floor plan? No ☐ Yes ☐

Is assistance from CS Israel required during installation? No ☐ Yes ☐

Scan (Examination) Room

Walls finished with minimum one coat of paint?	No ☐ Yes ☐
Lead glass installed?	No ☐ Yes ☐
Radiation shielding installed correctly? (see the Site Planning Guide, section on Radiation Protection)	No ☐ Yes ☐
Lead doors installed with height 2065 mm (81"), door width 1080 mm (43"), from 310 cm (122") wide corridor or door width 150 cm (59") from 230 cm (91") wide corridor?	No ☐ Yes ☐
Convenience outlets (3 minimum)?	No ☐ Yes ☐
Floor evenness and wave between any two points within the Gantry area does not exceed 5 mm (0.20")?	No ☐ Yes ☐
Floor evenness and wave between any two points within the Patient Table base area does not exceed 3 mm (0.12")?	No ☐ Yes ☐
Holes for anchoring Gantry and Patient Table drilled using Mylar?	No ☐ Yes ☐
X-Ray warning lights installed?	No ☐ Yes ☐
Ducts and channels according to site planning?	No ☐ Yes ☐
Structural engineering certificate for final location granted?	No ☐ Yes ☐
Air Conditioning system with dedicated room thermostat installed?	No ☐ Yes ☐
Is a magnet installed in the vicinity?	No ☐ Yes ☐
If yes, what is the field strength at Gantry location?	_____ Gauss

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Utility Room

Electrical preparations according to specifications? No ☐ Yes ☐

Line impedance according to specifications? No ☐ Yes ☐

Additional Protective Earth (APE) connection installed? No ☐ Yes ☐

Results of line monitoring over a period of at least 48 hours within tolerances specified for the site? No ☐ Yes ☐

Local power supply specification _____V _____Hz

Air conditioning sufficient to support heat dissipation load of Heat Exchanger (for data, refer to Site Planning Guide, section on Technical Data, Heat Dissipation) No ☐ Yes ☐

Air conditioning system with dedicated room thermostat installed? No ☐ Yes ☐

Water-water Heat Exchanger only:
Water inlet from clinic to Heat Exchanger according to specifications? No ☐ Yes ☐

Water-air Heat Exchanger only:
Outer wall for air inlet and outlet within 4 m (13 ft) from planned location of Heat Exchanger? No ☐ Yes ☐

Walls finished with at least one coat of paint? No ☐ Yes ☐

Light fixtures installed? No ☐ Yes ☐

At least two convenience outlets installed No ☐ Yes ☐

Door width at least 95 cm (37.4") No ☐ Yes ☐

Phone outlet (with outside line) installed? No ☐ Yes ☐

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Control Room

Direct outside telephone line ***with MODEM*** installed? No ☐ Yes ☐

Walls finished with minimum one coat of paint? No ☐ Yes ☐

Light fixtures with dimmer control installed? No ☐ Yes ☐

At least two convenience outlets installed? No ☐ Yes ☐

Door width 90 cm (35") minimum? No ☐ Yes ☐

Is a magnet installed in the vicinity? No ☐ Yes ☐
If yes, what is the field strength at Console location? _____ Gauss

Air conditioning system with dedicated room thermostat installed? No ☐ Yes ☐

Electricity emergency shutdown button installed? No ☐ Yes ☐

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Site Layout Information

General

The Mx8000 site preparation guidelines will assist you in the planning and construction phases of your CT scanner. The guidelines are intended to provide the site planner with electrical and mechanical information and to assist in determining construction requirements and cost data. This information should be used in conjunction with the drawings prepared for your particular site. Additional site planning assistance and information may be obtained by consulting the Site Planning Guide and, if necessary, by contacting Customer Support.

The Mx8000 system requires three separate but contiguous rooms (see *Figure 3-1*):

- The Scanning Room
- The Control/Computer Room
- The Utility Room

Figure 3-2 displays a scanning room without separate utility room.

A separate office/viewing room is recommended for the physician's independent Diagnostic Station, the MxView (optional). This room provides with a private area outside the normal flow of traffic and dedicated to diagnostic evaluation.

Approximately 75 square meters (807 square feet) are recommended for a Mx8000 system. This approximation should be used for planning purposes, but consideration must also be made for space required for service access. At your request, the Installation Department will provide you with feasibility studies for available locations.

NOTE

The dimensions in inches are rounded to the nearest foot.

Space, power, and air-conditioning requirements are outlined in tables and drawings. Additional planning considerations related to the installation and proper functioning of the Mx8000 systems are outlined below. System support rooms to suit individual operational procedures are recommended and should be considered by the system purchaser and the site planner.

Basic site requirements for the Scanning, Control, and Utility Rooms, as well as the office and patient preparation areas, are described in this manual.

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Legend:

1. Gantry
2. Patient Table
3. Operating Console
4. Computer Rack
5. Power Distribution Cabinet (PDC)
6. Heat Exchanger
7. Radiation-ON indicator

7A. Radiation-ON indicator (above Gantry or above Patient Table, mandatory in the USA)

8. Door switch
9. Telephone connection for remote diagnostics (next to the Computer Rack)
10. Emergency SHUTDOWN button
11. ON/OFF switch
12. Line power socket

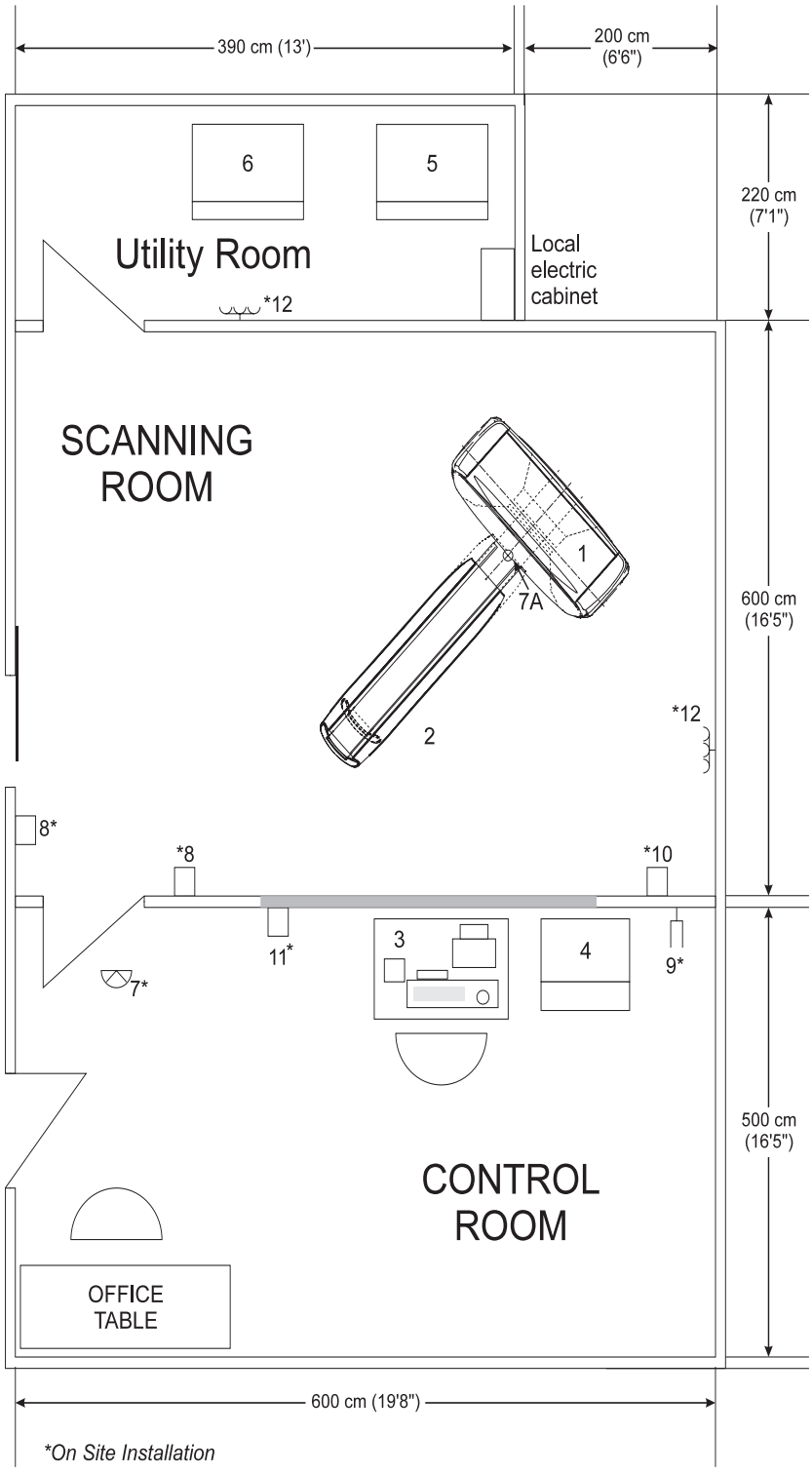
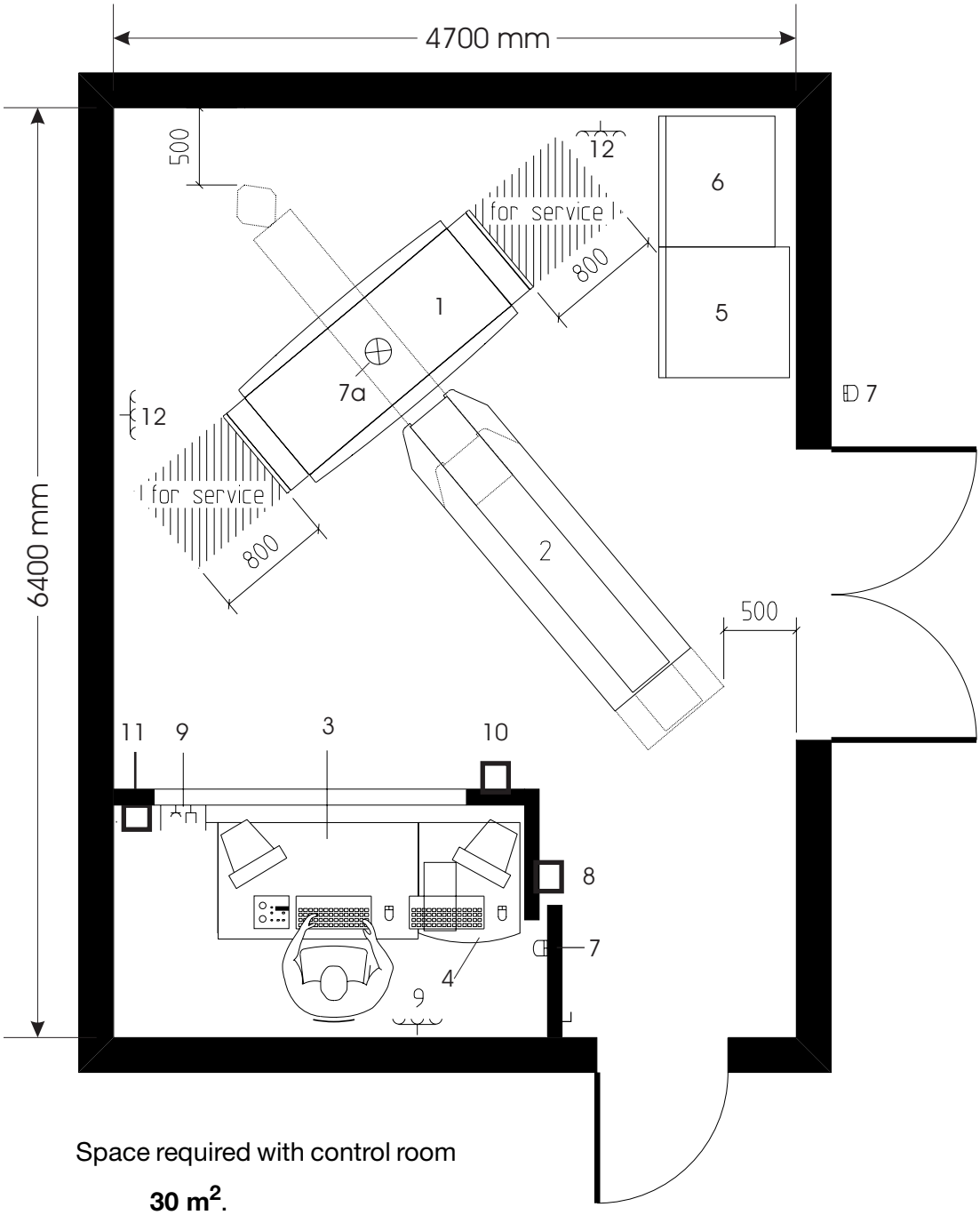


Figure 3-1: Typical Room With Utility/Control Room



Space required with control room

30 m^2.

Figure 3-2: Typical Room Without Utility/Control Room

Scanning Room

Scanning Room Dimension Requirements

The Scanning Room requires an entrance door with a minimum clearance of 108 cm (43") width by 207 cm height (82") and a corridor width of 310 cm (122"); or minimum door clearance of 150 cm (59") with a corridor width of 230 cm (91") in order to facilitate the moving of scanner components. A second smaller door located between the Control and Scanning Rooms is needed to allow convenient access to the patient by the operator.

Radiation shielding is required for the walls, and may be required for the floors and ceilings as well, to meet local ordinances. The final decision on specific shielding, however, rests with your radiation specialist. (Refer to the Site Planning Guide, section on Radiation Protection.) The Radiation Safety Officer is available to assist you in reviewing remission rates.

The Units in the Scanning Room

Mechanical components located in the Scanning Room include the Gantry and the Patient Table. *Table 3-1* shows the dimensions of the Gantry (not including the Transport Device) and the Patient Table. The space requirements for these units are determined by their size and service contingencies.

Table 3-1. Component Dimensions

Dimension/Weight*	Gantry**		Patient Table	
Length	2300 mm	90"	2555 mm	101"
Height	2050 mm	81"	1020 mm	40"
Width	982 mm	39"	675 mm	27"
Weight	2100 kg	4620 lb.	500 kg	1100 lb.

* *These dimensions do not include service clearance*
** *Specifications relating to the Gantry do not include the Transport Device.*

The equipment layout shown in *Figure 3-1* gives the operator the maximum view of the patient.

Dimensions of Units in the Scanning Room

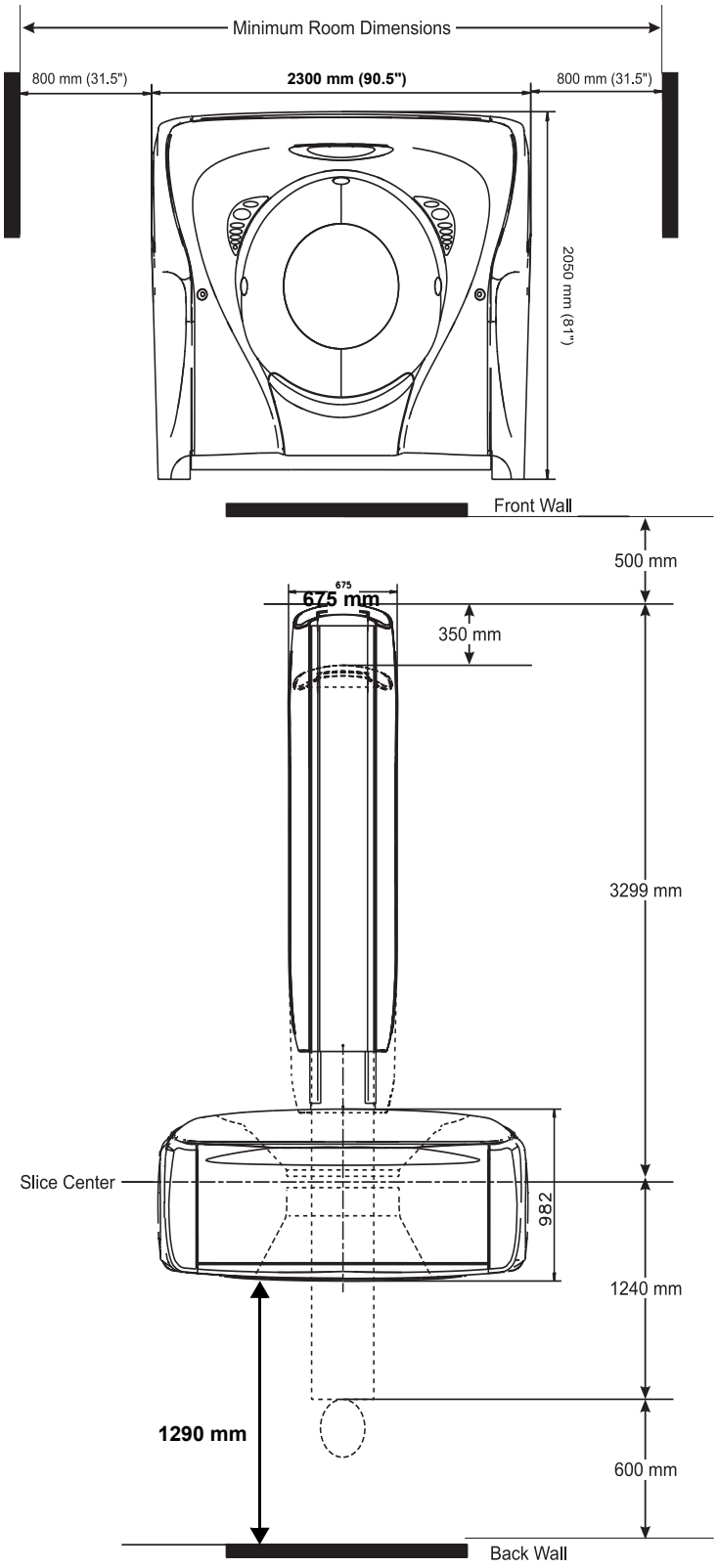


Figure 3-3: Minimum Scanning Room Length and Width Requirements

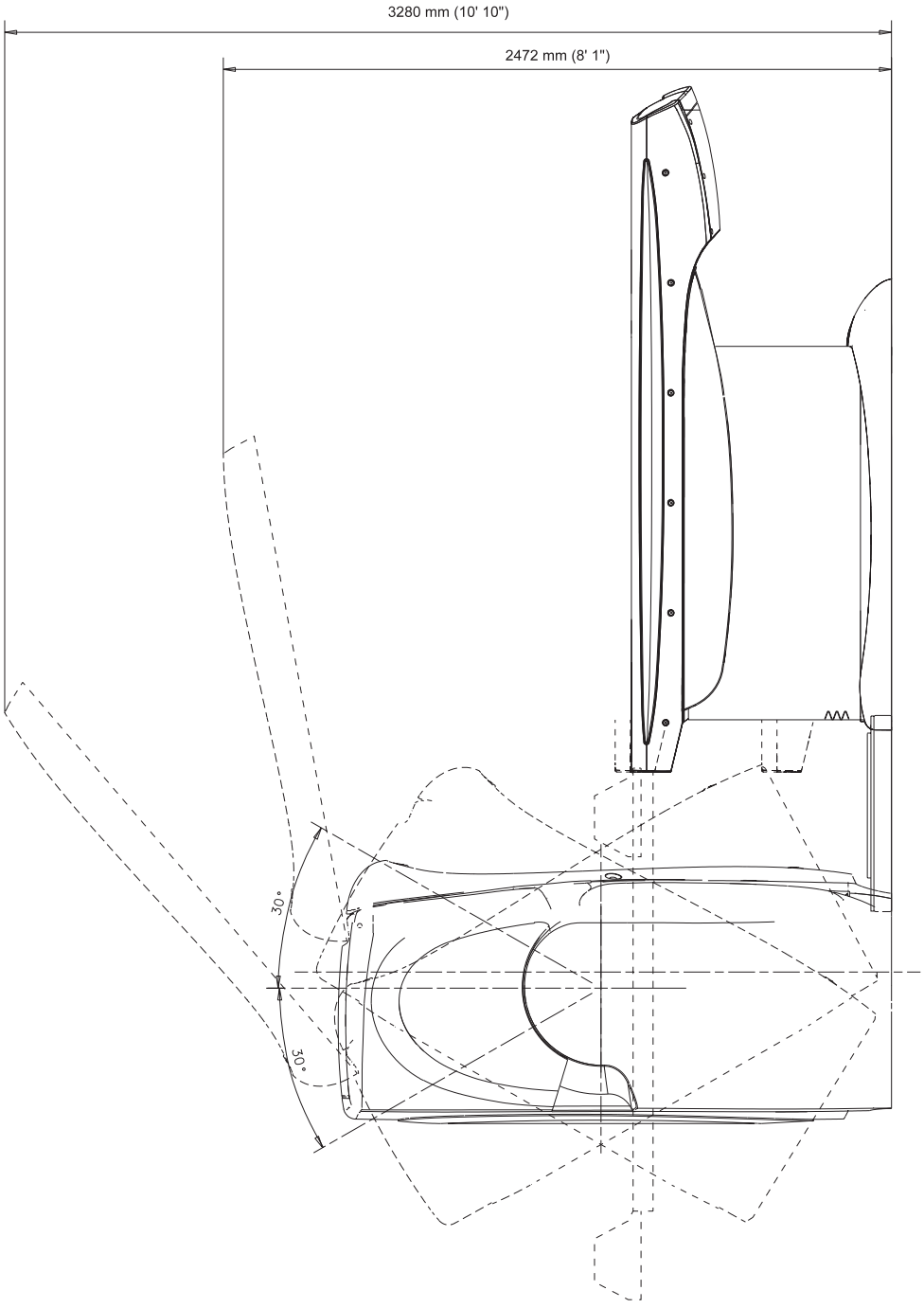


Figure 3-4: Minimum Scanning Room Height Requirements

Utility Room

The Utility Room should contain the Power Distribution Cabinet (PDC) and the Heat Exchanger. (For dimensions and weight, see *Table 3-2*.)

Table 3-2. Dimensions of PDC and Heat Exchangers

	Power Distribution Cabinet (PDC)	Heat Exchanger Water-water	Heat Exchanger Water-air
Width	750 mm 30"	750 mm 30"	900mm 35"
Height	1815 mm 71.5"	1815mm 71.5"	1815mm 71.5"
Length	900mm 35"	900mm 35"	900mm 35"
Weight	550 kg 1212 lb	200 kg 440 lb.	400 kg 882 lb.

NOTE

For site location and required distances from the wall, refer to the Site Planning Guide.

It is recommended that the floor be covered with PVC, and be without carpets.

Control Room

The Control Room accommodates the Operating Console and the Computer Rack. Dimensions and weights of each unit are listed in *Table 3-3*.

Table 3-3. Dimensions of Computer Rack and Operating Console

	Computer Rack	Operating Console
Length	660mm 26"	1100mm 43"
Width	780mm 31"	780mm 31"
Height	740mm 29"	740mm 29"
Weight	120kg 265 lb	70kg 154 lb

To provide protection from radiation, the patient observation window, located between the Control and Scanning Rooms, should be of lead glass, as specified in the Site Planning Guide.

The suggested observation window size, 152cm (60") wide, 91cm (36") high, should provide optimal patient visibility. The patient observation window should be directly in front of the Operating Console, with the window base at approximately 95cm (37") above floor level. The best view of the patient is obtained when the operator is close to the window (as shown in *Figure 3-1 on page 3-8*).

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An open space of at least 2.3 m^2 (25 ft^2) should be allocated behind the Operating Console to allow visitors to observe the CT in operation, without interfering with the operator's duties. Experience has shown this space is desirable, as it allows consulting physicians and support personnel into the Control Room without crowding.

A direct outside telephone line is necessary in the Control Room. A modem should be connected to it to enable remote connection to the scanner.

A second telephone line is necessary in the Control Room to expedite patient scheduling and for use by service personnel.

Patient Preparation Area

A separate preparation area is recommended to facilitate maximum patient throughput. Dressing facilities should be provided, as well as a waiting area for gowned patients. The Patient Preparation Area may be located near the Gantry or in a separate room which could accommodate one or more patients, depending on space availability.

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Chapter 4
Unpacking & Transporting System Units

Careful unpacking and transporting of the system units will help to prevent damage to the equipment and make installation easier.

This chapter provides instructions to unpack and transport the following units, in the order listed:

- The Gantry
- The Patient Table
- The Power Distribution Cabinet (PDC)
- The Heat Exchanger
- The Operating Console
- The Computer Rack

If a unit shows external or internal damage, contact the transportation company and file a damage claim under ICC regulations. In addition, contact the CT Customer Support immediately for further instructions.

NOTE

•Retain all cartons and packing materials until all units are installed and operating.
•While moving the Gantry, push only on the metal parts. Pushing or pulling the glass re-inforced epoxy covers will damage the doors and hinges.

Left and right references are from the point of view of a person standing at the open end of the Patient Table, facing the Gantry (see *Figure 2-1 on page 2-1*).

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Packing List

Table 4-1 lists the shipping cases that are included in a delivery of the Mx8000.

Table 4-1. Mx8000 Shipping Cases

Case Number	Contents	Length	Width	Height	Gross Weight
1	Gantry	250 cm (98.4 in.)	116 cm (45.7 in.)	235 cm (92.5 in.)	2816 Kg (6208 lb.)
2	Computer Rack	93 cm (36.6 in.)	84 cm (33 in.)	940 cm (37 in.)	198 Kg (437 lb.)
3	Operating Console	126 cm (49.6 in.)	106 cm (41.7 in.)	102 cm (40.2 in.)	200 Kg (441 lb.)
4	Accessories	122.5 cm (48.2 in.)	122.5 cm (48.2 in.)	89.5 cm (35.3 in.)	236 Kg (520 lb.)
5	Patient Table	270 cm 106.3 in.)	88 cm (34.6 in.)	137 cm (53.9 in.)	640 Kg (1411 lb.)
6	Power Distribution Cabinet (PDC)	111 cm (43.7 in.)	104 cm (40.9 in.)	198 cm (78 in.)	500 Kg (1102 lb.)
7	Computer and Monitor	132.5 cm (52.2 in.)	82.5 cm (43.3 in.)	95.5 cm (31.5 in.)	80 Kg (176 lb.)
8	Covers for Gantry	181 cm (71.3 in.)	111 cm (43.7 in.)	53 cm (20.990 in.)	200 Kg (441 lb.)
9	Bed Accessories and Service Kit	90 cm (35.4 in.)	86 cm (33.9 in.)	62 cm (24.4 in.)	300 Kg (661 lb.)
10 * or 10A*	Water-water Cooling System (WCS) or Water-air Cooling System (WCS)	105 cm (41.3 in.)	103 cm (40.6 in.)	214 cm (84.3 in.)	250 Kg (551 lb.) / 400 Kg (882 lb.)
11*	Air Hoses for Water-air WCS	132.5 cm 52.2 in.	82.5 32.5	95.5 37.6	50 Kg (110 lb.)

* *If your system has a water-water cooling system, there will be only 10 cases, i.e., no water-air WCS (10A) or air hoses (11).*
If your system has a water-air cooling system, there will be 11 cases, i.e., no water-water WCS (10).

The Gantry

This section describes how to unpack, transport and position the Gantry.

NOTE

We strongly recommend that you drill the anchoring holes for the Gantry before bringing the Gantry into the room. See *"Pre-installation - Using Mylars to Drill Anchoring Holes" on page 1-5*.

Unpacking the Gantry

Unpack the Gantry carefully, as follows:

1. Place the container on the floor, level with that of the installation site or the elevator, if needed.

NOTE

Use either a heavy duty fork lift or the Gantry lifting device (P/N 479-7181-4109) to lower the Gantry from the truck.

2. Remove the nails, the cardboard lid and the sides of the container, using a crowbar.
3. Remove the aluminum foil that covers the Gantry.
4. Detach the Gantry from the transport pallet (shown in *Figure 4-1*) as follows:
   a. Loosen and remove the two screws on each corner of the yellow transport bracket that fix the bracket to the Gantry, using a 19 mm socket.
   b. Loosen the eight 19 nuts securing the two yellow transport brackets to the transport pallet.
   c. Remove one 19 mm nut from one of the threaded studs secured to the transport pallet. This nut will be used to “double–nut” each threaded stud in order to remove the stud.

NOTE

Repeat the following step until all the threaded studs are removed.

d. Thread the spare nut onto another stud and tighten it against the face of the previously loosened nut. Engage the "doubled" nuts with a 19 mm socket or box–end wrench, loosen and remove the stud.

e. Remove the two transport brackets. Lift and pull the transport bracket away from the open side of each Gantry column.

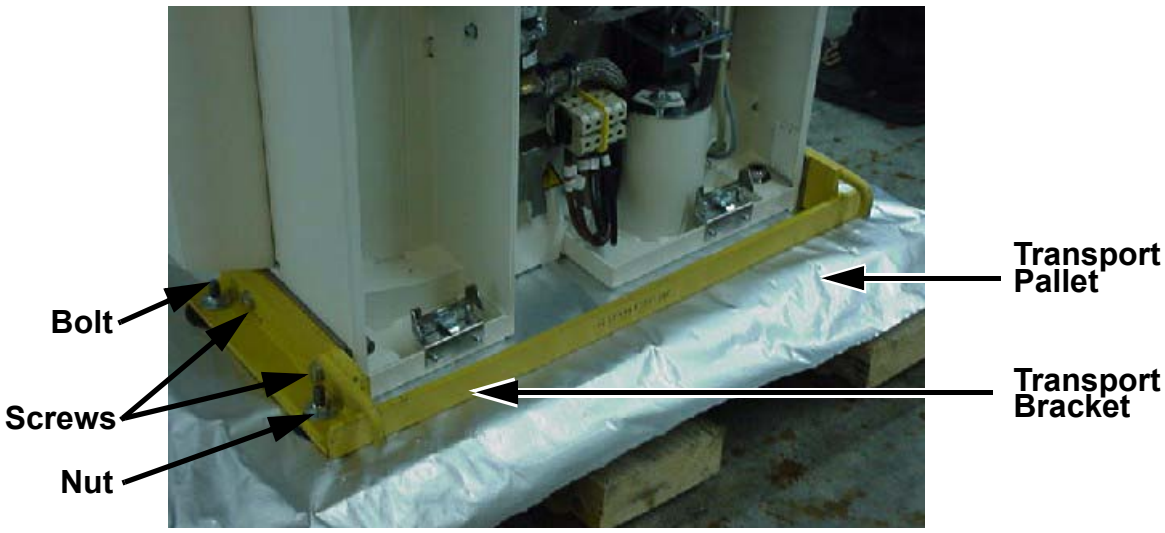

Figure 4-1: Gantry Attachment to Transport Pallet

5. Remove the transport devices and mounting hardware from the shipping crate.

NOTE

The approximate floor clearance (top of the jack screw to the top of the threaded collar) is 12.7cm (5").

5. Rotate the jack screws of each wheel to preset the approximate floor clearance.

6. Set the support arms with rollers to be aligned with the attachment arms of the transport device ("inline" position, see *Figure 4-2*).

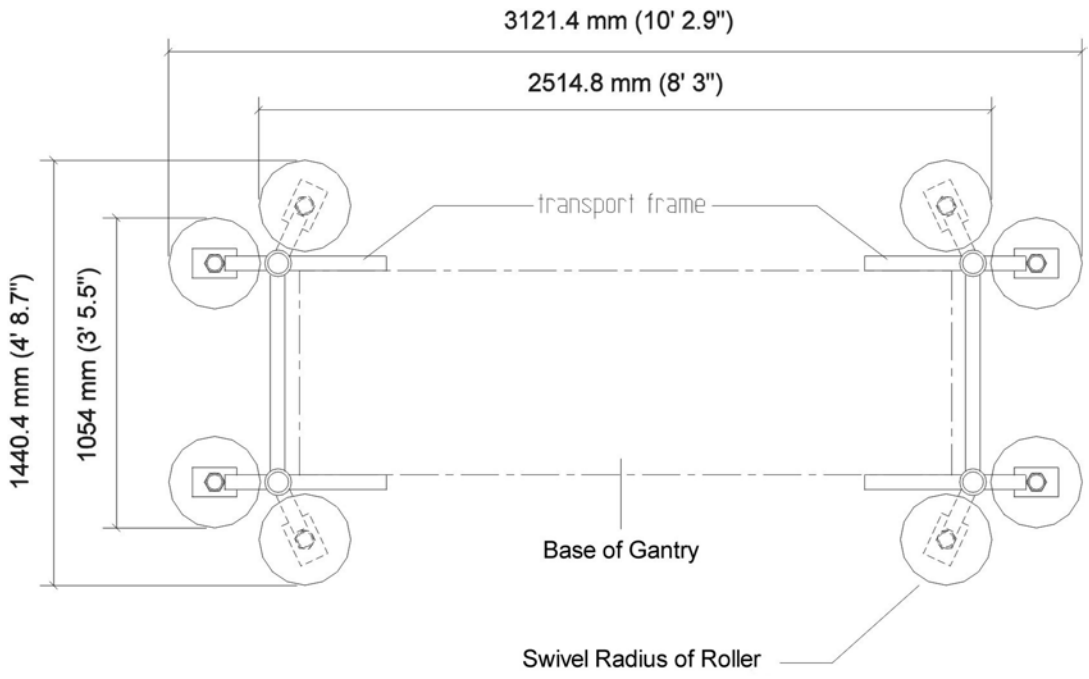

Figure 4-2: Gantry Transport Device

7. Attach the Transport Device (P/N BR71800017A) to both sides of the Gantry, as follows:
   a. Position the Transport Device in its place (shown in *Figure 4-3*).

Transport Device in place with the support arms in the “inline” position

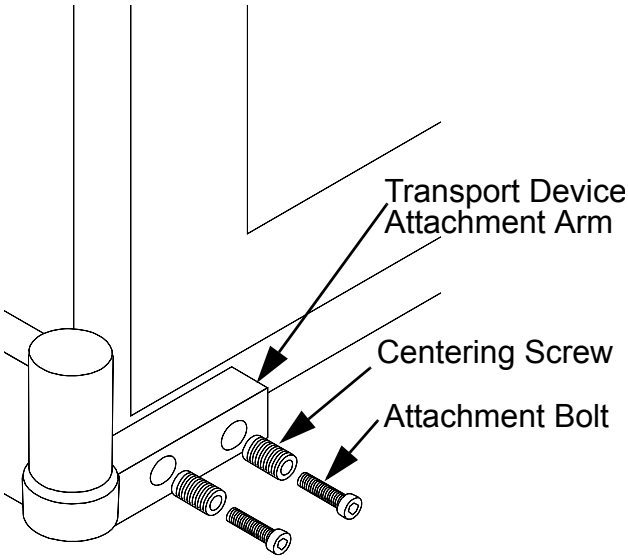

Figure 4-3: Transport Device Position, Centering Screws, and Attachment Bolts

b. Turn the four centering screws (clockwise) through the threaded holes in the transport device attachment arms and into the receiving holes in the Gantry frame with a 14 mm Hex Bit socket. See *Figure 4-3*.

NOTE

The clearance between the front and rear of the Gantry base and the inner face of the front and rear attachment arms should be the same on both sides to prevent damage to the Gantry base paint finish during transport of the Gantry.

c. Consecutively tighten or loosen the four centering screws to adjust the clearance between the front and rear of the Gantry base and the inner face of the front and rear Transport Device attachment arms.

d. Insert the four M12 attachment bolts (*Figure 4-3*) through the centering screws and into the threaded holes of the Gantry base.Torque the bolts to 77 Nm torque with a 10 mm Hex Bit socket.

e. Repeat steps 8.a. through 8.d. for the second Transport Device.

9. Ensure the four rollers are aligned to permit rolling the Gantry forward to clear the transport pallet.

8. Insert a metal rod through the eye of the jack screw and turn it clockwise to lower the rollers to the floor. Use a metal rod approximately 18” long with a diameter as close as possible to that of the eye of the jack screw.

9. Verify proper roller alignment. Continue rotating the four jack screws clockwise until the Gantry is clear of the transport pallet by approximately 5–10mm (3/8”).

10. Roll the Gantry forward to clear the transport pallet and move the pallet to an out–of–the–way location.

11. Perform the following steps to prepare the Gantry for transport:

a. Alternately rotate the jack screws counterclockwise to maintain the Gantry in a level position and lower it to the floor. This unloads the weight of the Gantry from the transport device rollers.

NOTE

Remove the transport device swivel–arm locking pins from their lock holes to rotate the transport device support arms. After positioning the support arms, reinsert the locking pins into the lock holes.

b. Swing the transport device support arms to the “outer” position. See *Figure 4-4*.

c. Position the rollers in the direction the Gantry is to be moved before loading them with the weight of the Gantry.

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NOTE

Maximum clearance between the Gantry base and the floor is 15–20mm (1/2”–3/4”).
Minimum clearance between the Gantry base and the floor is 7mm (1/4”).

d. Alternately rotate the jack screws clockwise to maintain the Gantry in a level position and raise the Gantry.

WARNING

CRUSH HAZARD—minimize the clearance between the gantry base and the floor when transporting the gantry. This will prevent excess stress on the jack screws and to reduce the possibility of tipping the gantry. Failure to comply may result in serious injury or death to service personnel.

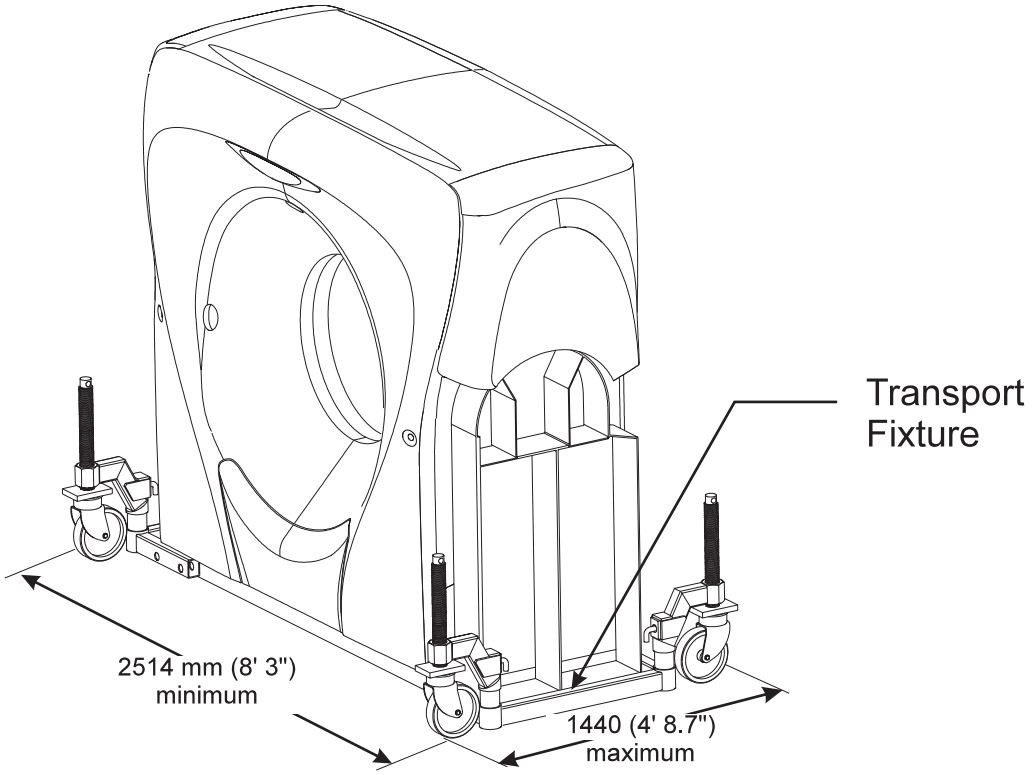

Figure 4-4: Normal Transport with Rollers in the “Outer” Position

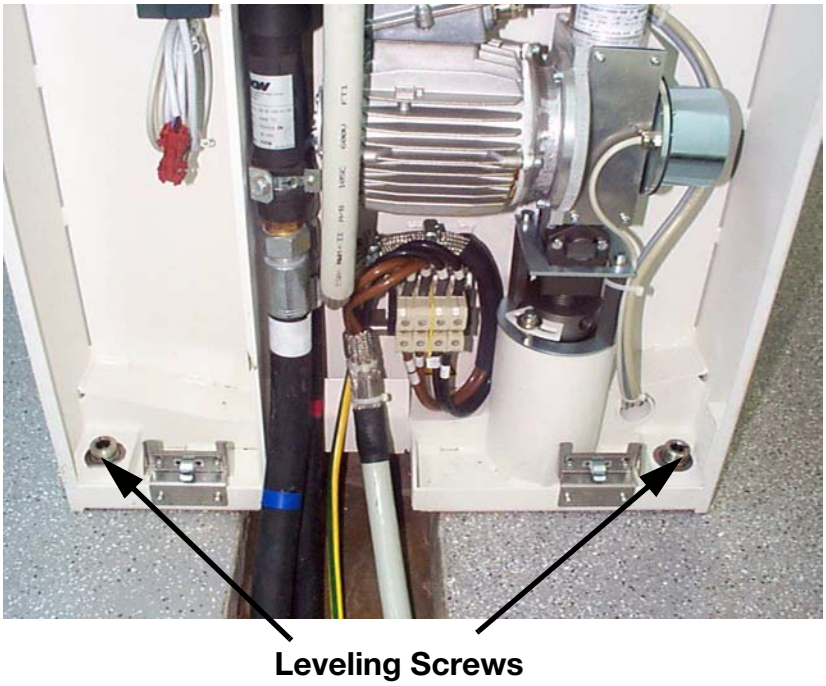

Figure 4-5: Gantry Leveling Screws

NOTE

The Gantry has four leveling screws (two shown in *Figure 4-5*), one at each corner of the Gantry base. The leveling screws are intended to be used to stabilize the Gantry if the floor is uneven and should not be used to bear the entire weight of the Gantry.

e. Turn the leveling screws counterclockwise (until the end stop is engaged) with a 14 mm Hex Bit socket and ratchet to ensure they do not protrude from the Gantry base.

Transporting the Gantry

General Guidelines

Observe the following guidelines when you transport the Gantry:

- Ensure that the floor load for the transport path as well as the installation rooms has been approved by a structural engineer prior to the installation.
- Use the rollers of the Transport Device to move the Gantry to the installation location. Turn the rollers of the Transport Device in the correct direction before transporting the components. To avoid damage, do not move the transport rollers over obstructions.
- Do not raise the components more than approximately 10 mm above the floor, to minimize the danger of tilting. Due to the minimal floor clearance of the components, the transport path must be smooth and level.
- Push the Gantry by exerting pressure only on the rollers of the Transport Device. Avoid exerting pressure on the covers.
- It is possible to swivel the rollers of the Transport Devices on their axes. To rotate them, release the locking pin and rotate them manually to the required position.

CAUTION

When transporting the Gantry, keep it as close to the floor as possible to prevent excessive stress on the spindles.

Transport Dimensions

Table 4-2 shows the dimensions of the Gantry, when it is on the Transport Device.

Table 4-2. Gantry Dimensions with the Transport Device

Description	Dimensions	
	mm	inches
Max. transport length	3121	123
Min. transport length	2514	99
Max. transport width	1440	57
Min. transport width	1054	41
Min. transport height	1990	78

Removal and Installation of the Gantry Front Cover

If you cannot transport the Gantry because of narrow spacing, remove the Gantry front cover.

NOTE

The following procedure requires three people.

Cover Removal

1. Transport the Gantry to an area with a large enough space to perform the following procedure. Verify that there is enough room to refit the cover at the end of the procedure.
2. Release the two screws located at the bottom of the front cover and open the cover.
3. Check if the hinge position is marked on the cover. If it isn't, mark it prior to removing the cover (see *Figure 4-6* and *Figure 4-7*)

NOTE

If the cover is not returned to it's original location, the positioning of the laser light markers, mylar gasket and other parts are affected.

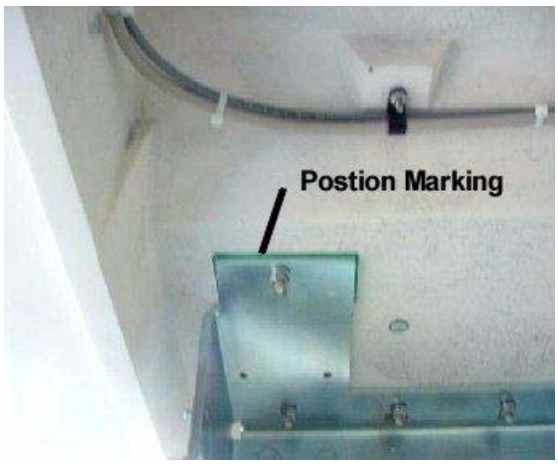

Figure 4-6: Left Side

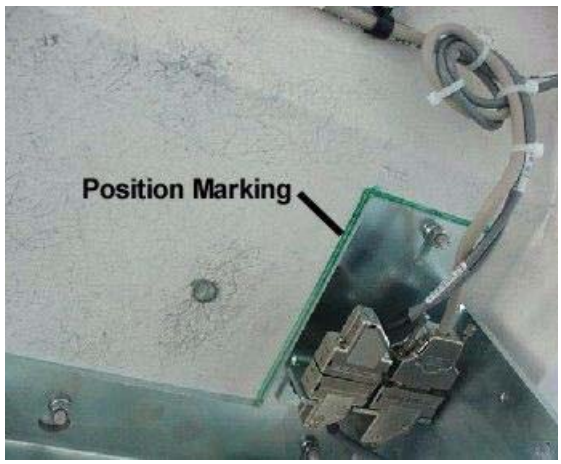

Figure 4-7: Right Side

4. Disconnect the two connectors from the Gantry front cover (see *Figure 4-8*).

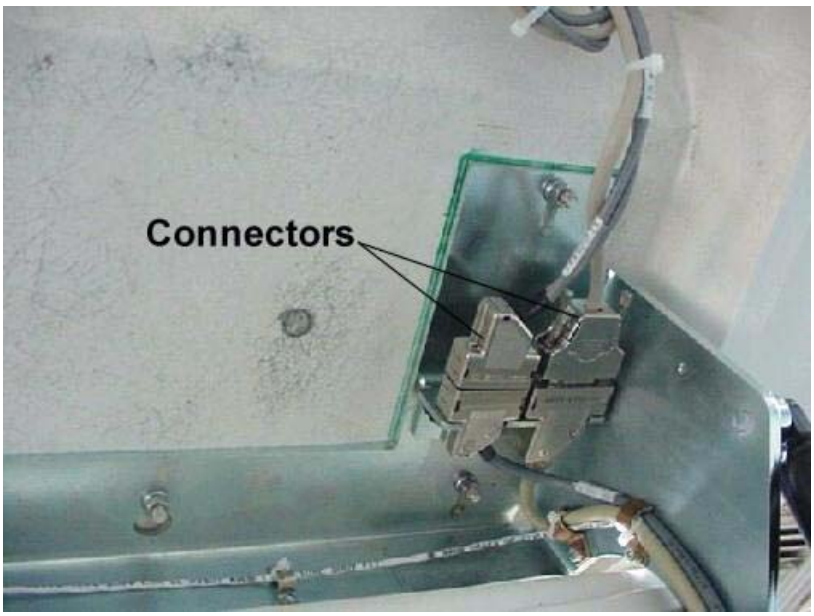

Figure 4-8:

5. Disconnect the white wire from the upper laser light marker (see *Figure 4-9*).

Figure 4-9:

6. Hold the Gantry front cover from both sides and release the ten screws that secure the hinge to the front cover (see *Figure 4-10*).

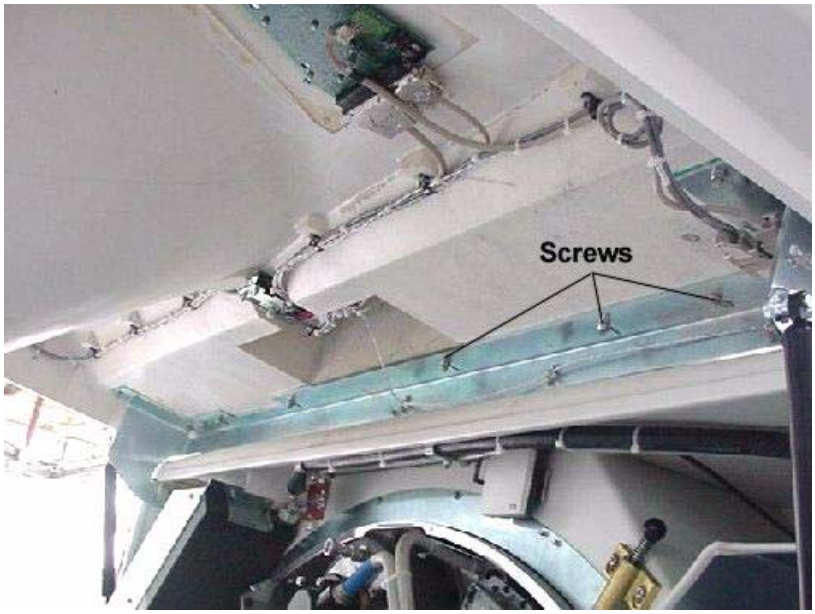

Figure 4-10:

7. Remove the cover with caution.

Cover Installation

1. Position the cover with the aid of the marked lines.
2. Tighten the ten screws to a torque of 8 Ncm and verify that the cover does not move from the marked line.
3. Connect the white wire from the upper laser light marker.
4. Connect the two connectors.
5. Close the front cover.

Final Verification

1. Check that the front cover closes properly.
2. Check that the mylar gasket is correctly positioned in the groove.
3. When turning on the system for the first time, check and properly align the laser light markers. If any of the laser light markers need adjustment, refer to *"Adjustment of the Cover Laser Light Markers" on page 8-14*

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Removal and Installation of the Gantry Bottom Cover

Bottom Cover Removal

1. Open the Gantry front cover.
2. Remove the three nuts on each side of the bottom cover (see *Figure 4-12*).

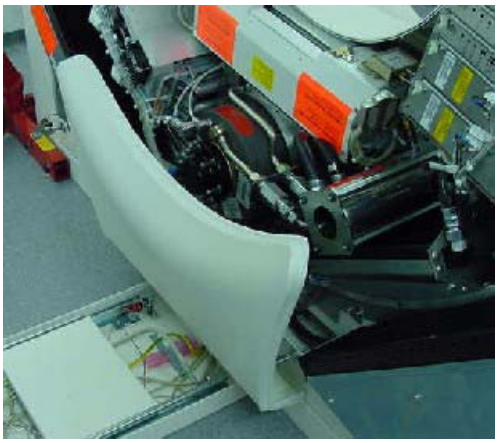

Figure 4-11: Bottom Cover

Figure 4-12: Top View of Bottom Cover

Bottom Cover Installation

1. Position the bottom cover with the screws.
2. Tighten the three nuts to a torque of 8 Ncm.
3. Close the Gantry front cover.

Transport Weights

The Gantry itself weighs 2100 kg, ***without*** the weight of the Transport Device.

The Transport Device weighs 70 kg.

Normal Transport

During normal transport of the Gantry, the minimum floor clearance is 7mm (0.28 in.).

Swivel the rollers (support arms) of the Transport Device out, so that they face each other, as shown in *Figure 4-13*.

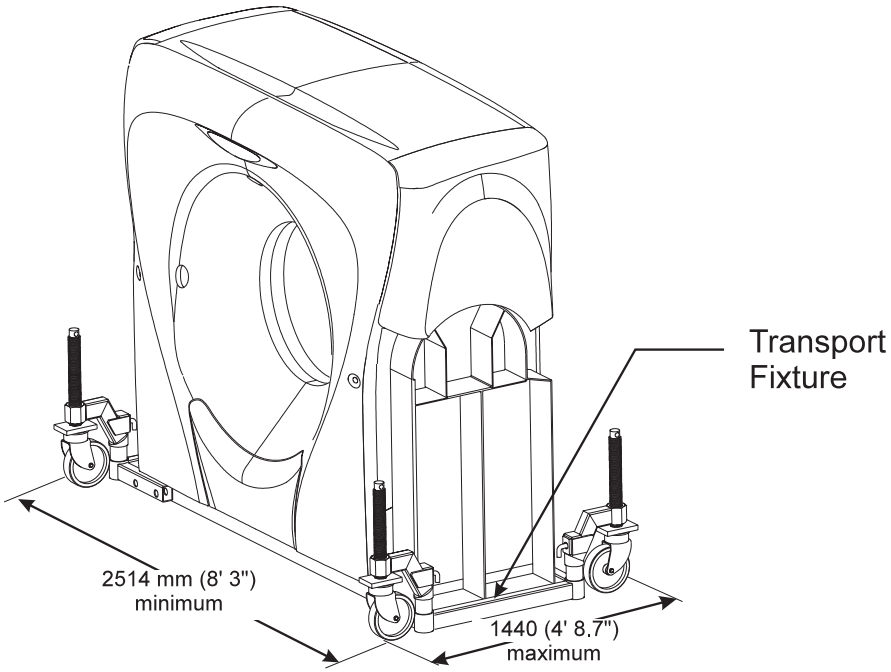

Figure 4-13: Normal Transport

Transport though Narrow Spaces

When you must transport the Gantry through narrow spaces, swivel all the rollers (support arms) of the Transport Device in, so that they face the Gantry as shown in *Figure 4-14*.

In case you do not have the required clearance, removal of the front covers may be necessary.

Table 4-3. Gantry Dimensions After Cover Removal

Not Enough Clearance	Cover Removal	Gantry Dimensions After Cover Removal	
		Height	Width
Height (refer to *Table 4-2*)	Front Cover	2.00m	1.10m
Width (refer to *Table 4-2* and *Table 4-3*)	Front and Bottom Cover	2.00m	0.79m

Lower the transport device to the lowest possible floor clearance.

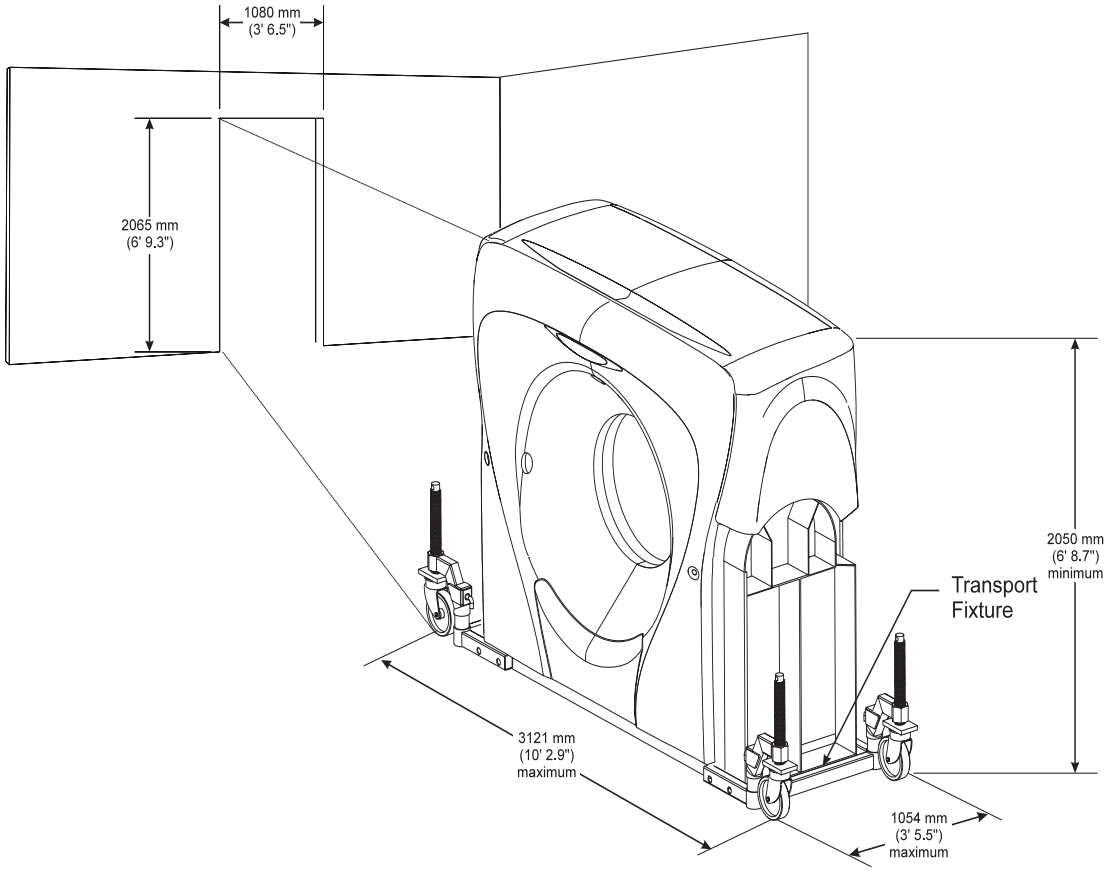

Figure 4-14: Transport through Narrow Spaces

Transport through Doors and Hallways

Minimum Door Width and Minimum Hall Width

Figure 4-15 and *Figure 4-16*, illustrate how to position the rollers of the Transport Device as you transport the Gantry through narrow and typical doors and halls.

Figure 4-15 illustrates the relationship between the minimum door width, the resulting minimum width of the hallway and transporting the Gantry around a corner.

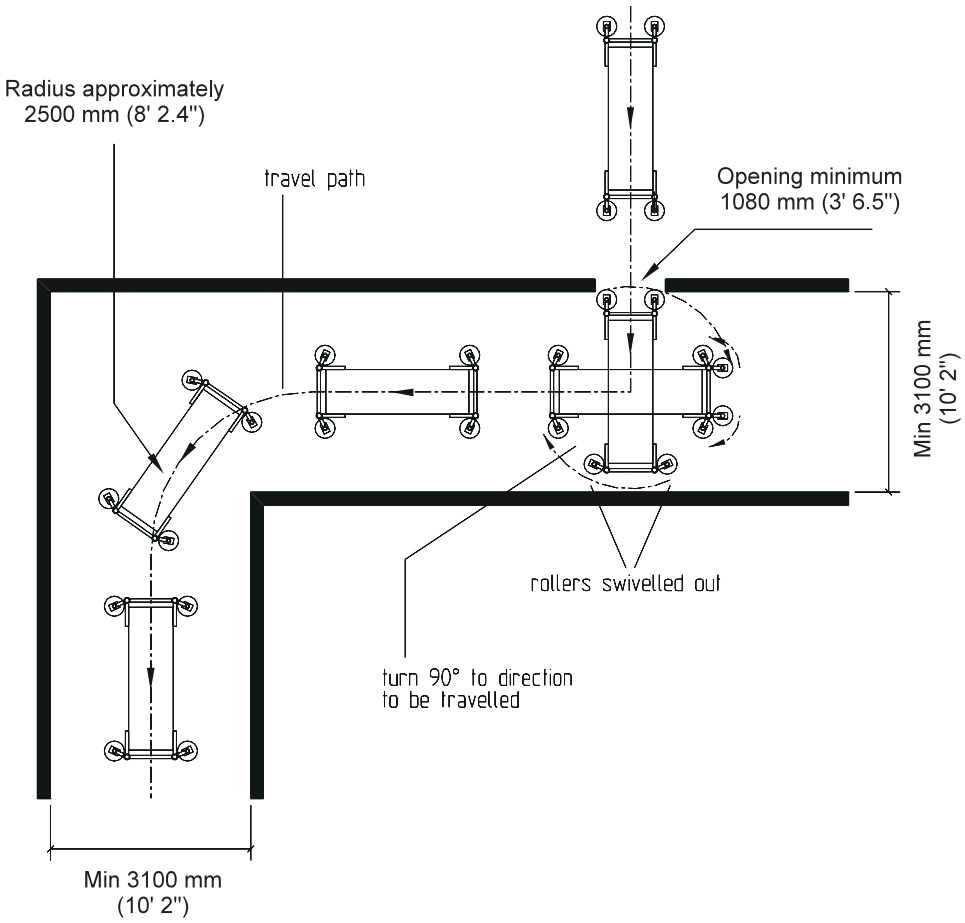

Figure 4-15: Minimum Door and Hall Width

Minimum Door Width and Typical Hall Width (2300mm / 91 in.)

Figure 4-16 illustrates the relationship between a typical hallway 2300 mm (91 in.) wide and the resulting minimum door width.

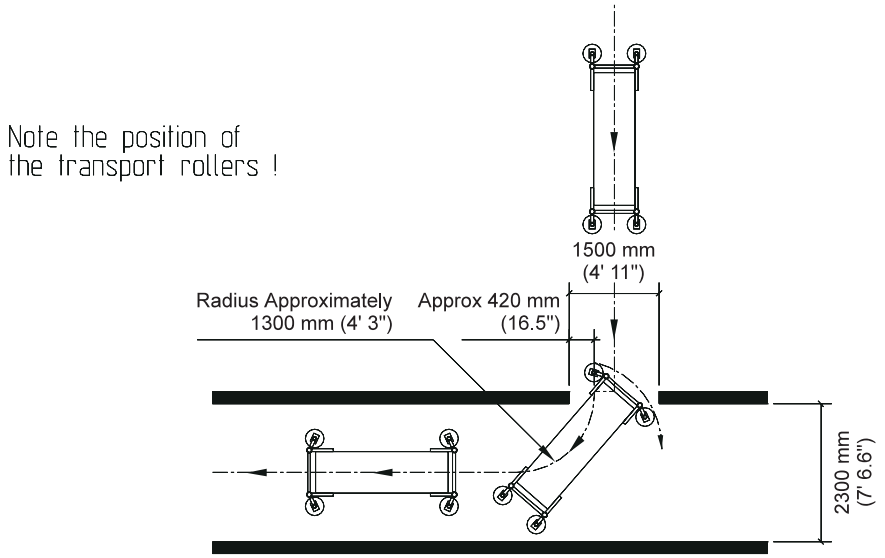

Figure 4-16: Minimum Door Width and Typical Hall Width

The Patient Table

Unpacking the Patient Table

Unpack the Patient Table carefully (shown in the packing case in *Figure 4-17*), as follows:

1. Place the pallet with the Patient Table on the floor.
2. Using the crowbar, remove the nails and the cardboard lid and sides.
3. Remove the wooden cover from the upper part of the table and position it in front of the pallet to form a ramp. Secure the cover to the pallet with the two screws, using a 17 mm Hex socket.
4. Remove the cover of the Connection Piece by opening the four screws, using a 3 mm Allen key.
5. Remove the two screws that attach the Connection Piece to the pallet, using a 4 mm Allen key, and set aside the Connection Piece in a safe place where it will not be damaged.
6. Detach the Patient Table from the transport pallet by opening the four attachment screws shown in *Figure 4-18*, using a 17 mm Hex socket. To access the screws, with your hand, lift the lower part of rubber bellows.

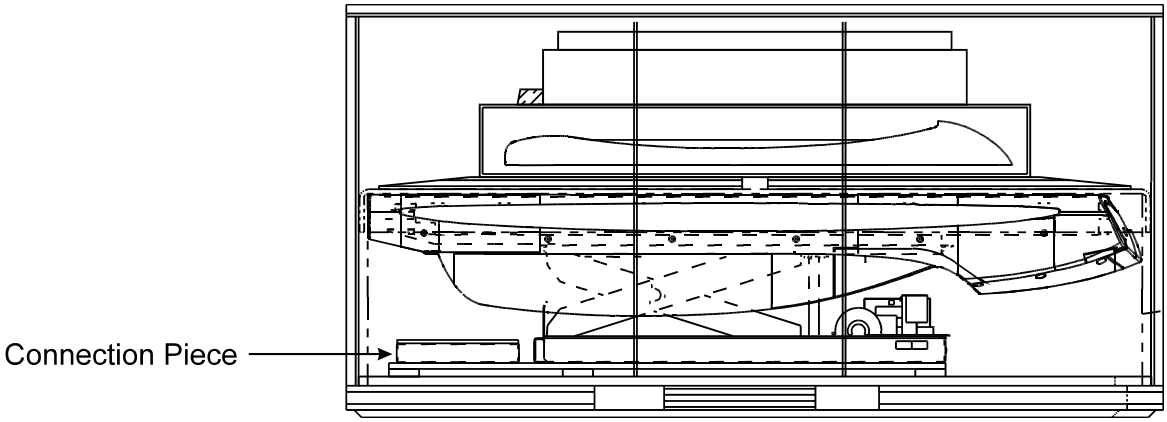

Figure 4-17: Patient Table on its Transport Pallet

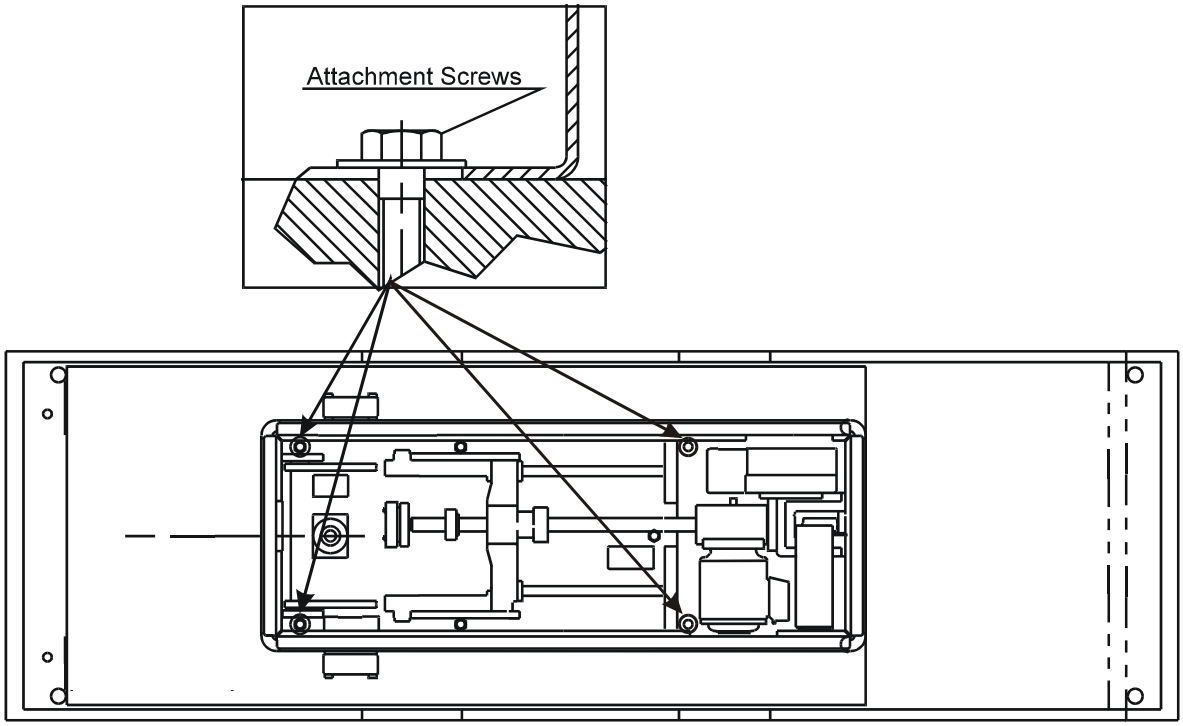

Figure 4-18: Location of Pallet Screws

Transporting the Patient Table

The Patient Table has three separate Transport Rollers. Two are on the sides of the Table, near the Gantry end. The third roller is in the center, at the end of the Patient Table farthest from the Gantry. See *Figure 4-19*.

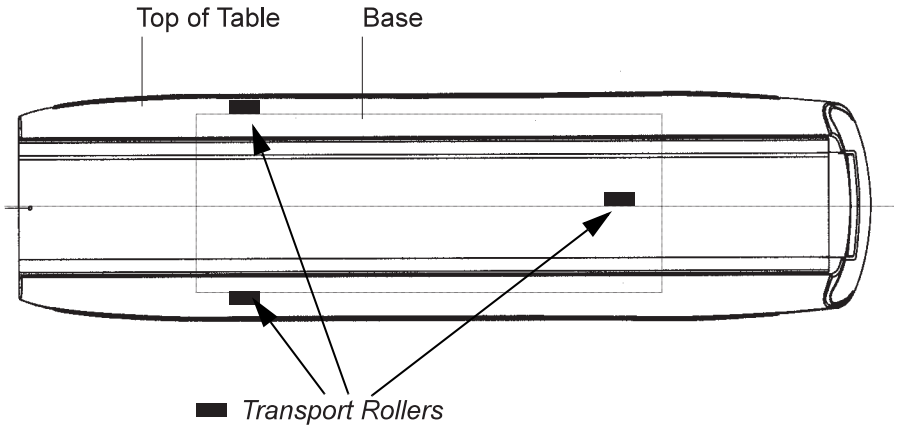

Figure 4-19: Locations of Transport Rollers

Do the following steps to transport the Patient Table:

1. Raise the Patient Table to the maximum floor clearance by turning the two screws on each of the side rollers clockwise. Turn the screws the same number of turns, using a 13 mm Hex socket. See *Figure 4-20*, on the left.

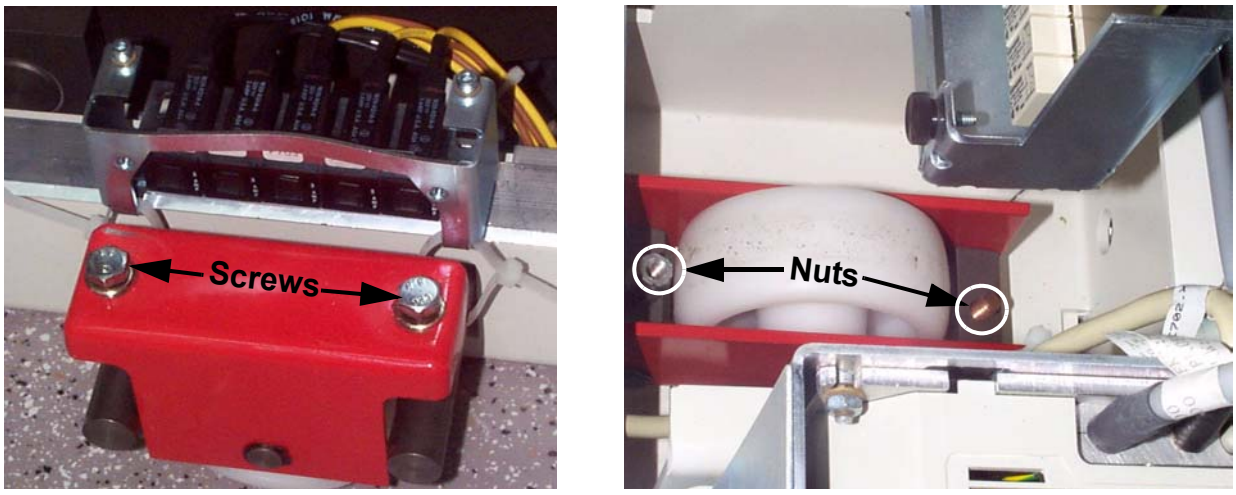

Figure 4-20: Roller Screws and Nuts

2. Raise the rear of the Patient Table by turning both nuts of the third roller the same number of turns, using a 10 mm Hex socket. See *Figure 4-20*, on the right.
3. Carefully move the Patient Table down the ramp, onto the floor and roll it to the required position.

NOTE

Sudden movements may damage the base components of the table.

CAUTION

The maximum floor clearance for transport is 24 mm (1 in.) in front and 15 mm (approximately 0.6 in.) behind. For this reason, the transport path should be relatively smooth and level.

Power Distribution Cabinet (PDC)

Before installation, verify that the:

- Location fulfills all the requirements as stated in the Site Planning Guide.
- Necessary distance is maintained between the PDC and the wall.

Unpack the Power Distribution Cabinet (PDC) carefully as described in the following steps:

1. Place the crate on the floor and remove the lid and sides of the container.
2. Using a forklift, move the PDC to its installation location, leaving a space of approximately 1 m (3 ft) between the rear of the cabinet and the wall to allow working space.
3. Lower the transport pallet with the PDC on it, to the floor.
4. Detach the cabinet from the transport pallet as described below. Refer also to *Figure 4-21*.

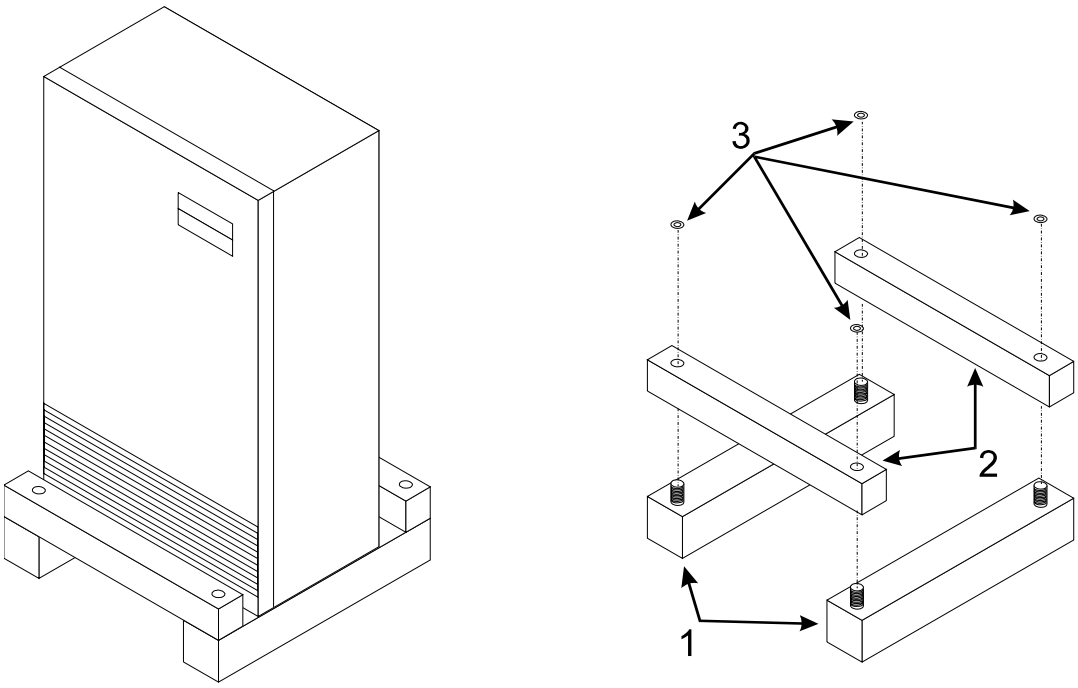

Figure 4-21: Detaching the Transport Pallet from the PDC

a. Remove the four nuts (**3**) from the pallet using a 17 mm socket and wrench.

b. Remove the crossbeams (**2**) from the pallet.

c. Remove the four nuts from the screws that attach the cabinet to the pallet at the four corners of the inner surface of the cabinet, using a 17 mm open wrench.

To access the nuts, remove the plastic pins that cover the screws, remove the screws, and remove the side lower covers of the cabinet. See *Figure 4-22*.

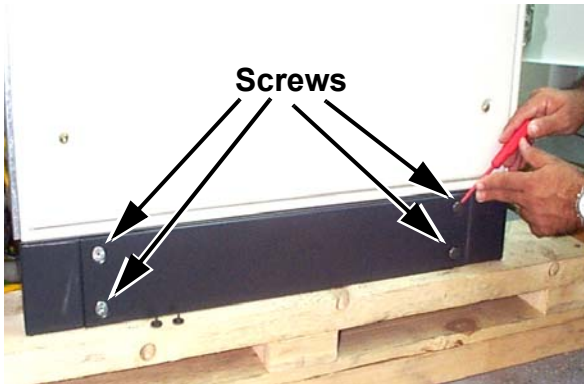

Figure 4-22: Removing the Side Lower Covers

d. Let the cabinet remain on the two wooden bars (**1**).

5. Lift the PDC from the transport pallet and place it on the floor as described below.

a. Tilt the cabinet to one side and remove the wooden bar (**1**).

b. Carefully lower the cabinet to the floor.

c. Now tilt the cabinet to the other side and remove the second wooden bar.

d. Lower the cabinet to its place.

6. If required by local regulations, secure the cabinet to the floor. Refer to *Chapter 5 - Positioning and Anchoring System Units*, in this manual.

Heat Exchangers - Water-Water & Water-Air

This procedure is identical to the procedure for unpacking the PDC (Power Distribution Cabinet).

Before installation, verify that the:

- Location fulfills all the requirements as stated in the Site Planning Guide.
- Necessary distance is maintained between the Heat Exchanger and the wall.

Unpack the Heat Exchanger as described in the following steps:

1. Place the crate on the floor and remove the lid and sides of the container.
2. Using a forklift, move the Heat Exchanger to its installation location, leaving a space of approximately 1 m (3 ft) between the rear of the Heat Exchanger and the wall to allow working space.
3. Lower the transport pallet with the Heat Exchanger on it, to the floor.
4. Detach the Heat Exchanger from the transport pallet as shown in *Figure 4-23* and as described below:

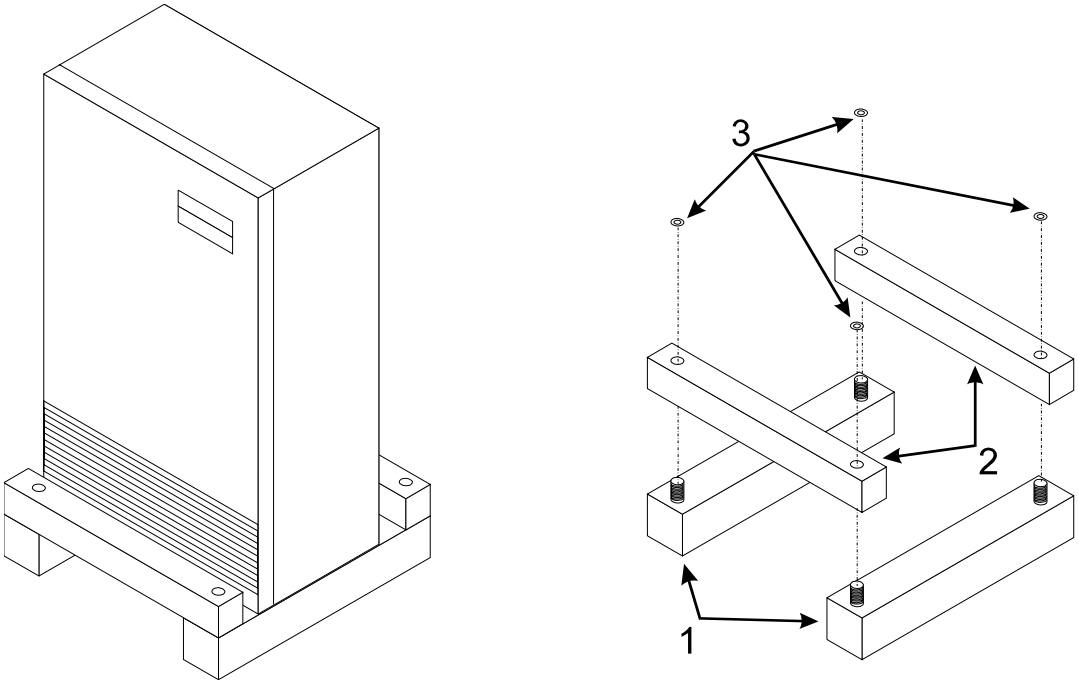

Figure 4-23: Detaching the Transport Pallet from the Heat Exchanger

   a. Remove the four nuts (3) from the pallet using a 17 mm socket and wrench.

   b. Remove the crossbeams (2) from the pallet.

   c. Remove the four nuts from the screws that attach the Heat Exchanger to the pallet at the four corners of the inner surface of the Heat Exchanger,

using a 17 mm open wrench.

To access the nuts, remove the plastic pins that cover the screws, remove the screws, and remove the side lower covers of the cabinet. See *Figure 4-24*.

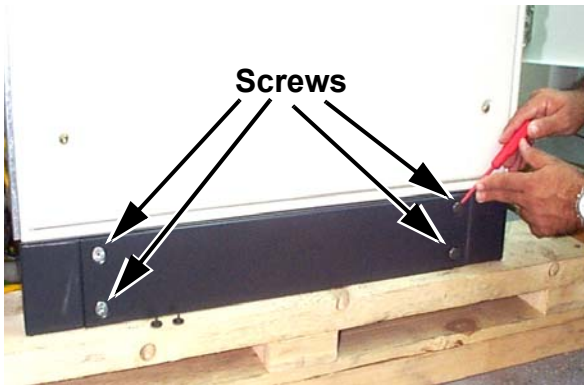

Figure 4-24: Removing the Side Lower Covers

d. Let the Heat Exchanger remain on the two wooden bars (**1**).

5. Lift the Heat Exchanger from the transport pallet and place it on the floor as follows:

a. Tilt the Heat Exchanger to one side and remove the wooden bar (**1**).

b. Carefully lower the Heat Exchanger to the floor.

c. Now tilt the Heat Exchanger to the other side and remove the second wooden bar.

d. Lower the Heat Exchanger to its place.

6. If required by local regulations, secure the Heat Exchanger to the floor. Refer to *Chapter 5 - Positioning and Anchoring System Units*, in this manual.

The Operating Console

Unpack the Operating Console as follows:

1. Dismantle the top and sides of the container.
2. Remove the nylon covers.
3. Loosen the screws that fix the Operator Console to the pallet. See Item 1, *Figure 4-25*.

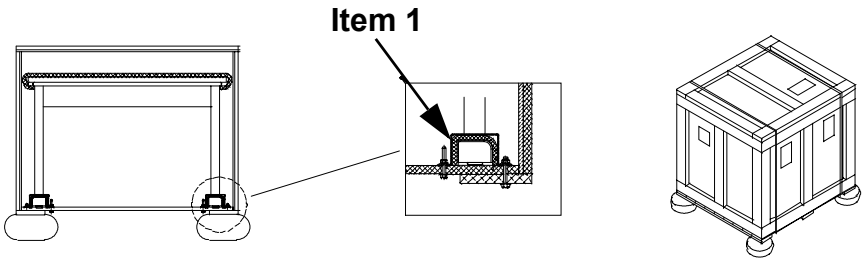

Figure 4-25: Operator Console Attachment to Pallet

NOTE

If local regulations require that the Operating Console be bolted to the floor, retain the metal part that attaches the table to the pallet for this purpose.

4. Lower the Operating Console to the floor.
5. Lift the front part of the Operating Console so that it rests on the two rear wheels and roll the desk to the required position, leaving a working space behind it.
6. Fix the desk firmly on the two pedestals located on the front side of each leg to prevent it from slipping.

The Computer Rack

Unpack the Computer Rack as follows:

NOTE

The top flaps and bottom edge of the cardboard box are secured with staples to a wooden frame inside the cardboard box.

1. Open the cardboard box by pulling back the top flaps.
2. Cut the sides of the cardboard box along the corners and remove the cardboard.
3. Remove the wood of the frame surrounding the top and sides of the Computer Cabinet.
4. Unwrap the protective plastic sheeting.
5. Remove the front and rear wooden blocks attached to the base of the transport pallet.
6. Disassemble one wooden frame. Stack the three sections of the wooden frame to assemble a spacer and place the spacer next to the rear edge of the transport pallet.

Figure 4-26:

Rolling the Computer Cabinet off the Transport Pallet

Figure 4-27:

7. Place the ramp from the Patient Support on top the wooden spacer.
8. Lift the front edge of the Computer Rack to shift its weight onto the rear rollers.
9. Carefully roll the Computer Rack off the pallet onto the ramp and then to the floor.
10. Roll the Computer Rack to its proper position in the Control Room.

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Chapter 5
Positioning and Anchoring System Units

Both the Gantry and the Patient Table must be securely anchored to the floor with bolts.

Other system units, such as the Power Distribution Cabinet (PDC) and the Operating Console need not be anchored to the floor unless required by local regulations.

This chapter describes how to position and bolt the following units to the floor, in the order listed:

- The Gantry
- The Patient Table
- The PDC and the Heat Exchanger (same procedure for both)
- The Operating Console
- The Computer Rack

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Positioning the Gantry

The Gantry has four pedestals (*Figure 4-5* shows two of them), one at each corner of the Gantry base. The pedestals are used to stabilize the Gantry if the floor is uneven.

1. Transport the Gantry to the installation location.
2. Remove the metal plate (indicated in *Figure 5-1*) on the lower part of the Gantry's left column using a 3 mm Hex Bit socket and ratchet.

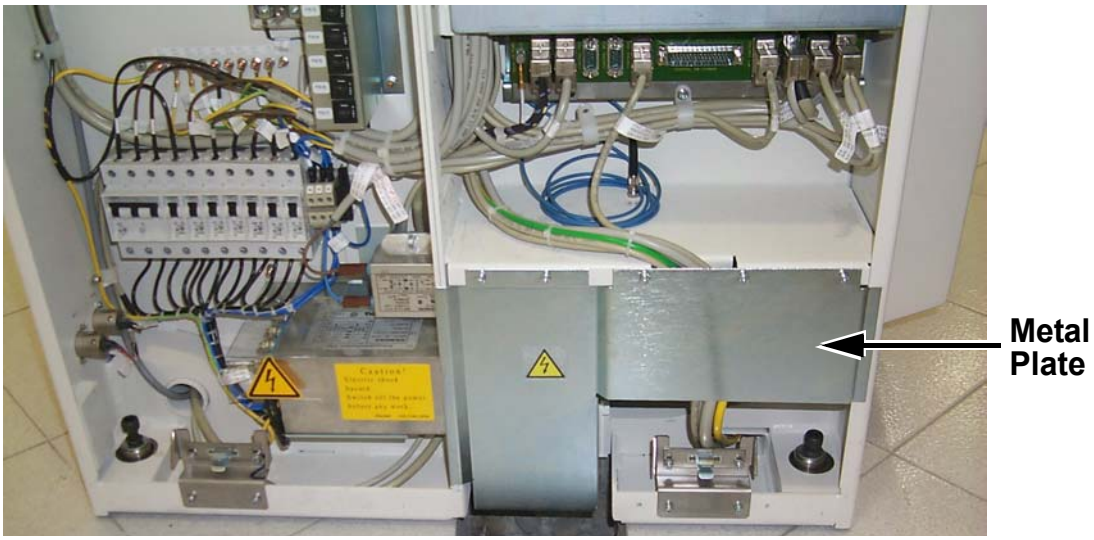

Figure 5-1: Metal Plate in the Left Leg of the Gantry

3. Turn the leveling screws counterclockwise (until the end stop is engaged) with a 14 mm Hex Bit socket and ratchet to ensure they do not protrude from the Gantry base.

NOTE

Care must be taken to avoid the floor trough openings when positioning the Gantry.

4. Position the Gantry to align the through–holes of the leveling screws with the four floor anchors. Utilize the four chamfered pins to assist with the alignment as follows:
   - **a.** Align one leveling screw through–hole and one anchor.
   - **b.** Insert a chamfered pin through the leveling screw through–hole and into the anchor to "pin" the position.
   - **c.** Roll the gantry to align the other leveling screw through–hole/anchor pairs using the first pin as a pivot.
   - **d.** Pin each leveling screw through–hole/anchor pair as they become aligned.

WARNING

Pinch Hazard—use extreme caution when lowering the gantry to the floor. Keep etremities away from the gantry base until the weight of the gantry rests completely on the floor. Fingers can be caught in close clearances between the screw jacks, gantry, and floor. Failure to comply may result in serious injury to service personnel.

5. Alternately rotate the jack screws counterclockwise to maintain the Gantry in a level position and lower it to the floor. Use the metal rod selected in step 10. of the section entitled *"Unpacking the Gantry"*.

NOTE

Do not remove the transport device because the Gantry still must be leveled.

Verify the gantry–to–floor anchor alignment as follows:

1. Remove the four chamfered alignment pins.
2. Insert an M–10 bolt with washer and lock washer attached through each leveling screw and into the floor anchor.

NOTE

It may be necessary to adjust the position of the Gantry to permit engagement of all four bolts in the floor anchors.

3. Thread the bolt counterclockwise two to three turns into the floor anchor with an 8mm Hex Bit and ratchet.

Anchoring the Gantry

If you have not yet drilled the holes for the anchors using the Mylar, do it now. See "Required Tools" on page 2-4.

The installation materials included with the Mx8000 system are for anchoring the Gantry to a floor made of concrete.

NOTE

To anchor the Gantry to other types of floors, purchase the appropriate installation materials locally.

1. Use an 8mm Hex Bit socket and ratchet to snug the four M–10 anchor bolts.
2. Torque the four M–10 anchor bolts to 50 Nm.

Installing the Anchors

The Gantry must be securely anchored to the floor with bolts. This section describes how to install the Gantry anchors in the floor.

NOTE

The installation materials included with the Mx8000 system are for anchoring the Gantry to a floor made of concrete. To anchor the Gantry to other types of floors, purchase the appropriate installation materials locally.
The anchors for the Gantry are bigger than the anchors for the Patient Table. The Gantry anchors use M10 screws.

Insert the anchors supplied with the system into the four holes as follows:

1. Dismantle the anchor into two parts, as shown in *Figure 5-2*.

Figure 5-2: The Assembly Tool and Anchors

2. Insert the lower part of the anchor into the hole.

CAUTION

Ensure the lower half of the anchor is centered and in–line with the hole (not tipped).

3. Using the supplied punch (hollow metal tube) and a hammer, punch the lower part of the anchor into the hole.
4. Insert the upper part of the anchor into the hole and secure it to the lower part using a screwdriver.
5. Insert the assembly tool into the hammer drill. Then, use the drill to gently press the assembly tool onto the upper part of the anchor and turn the upper part of the anchor until it is secure.

The assembly tool will apply the necessary force to secure the anchor. When finished, the upper part of the anchor should be approximately 1 mm below the surface of the floor.

6. Repeat steps *1* through *5* to fix the remaining three anchors into their holes.

Bolting the Gantry to the Floor

Bolt the Gantry to the floor, as follows:

1. Move the Gantry to its correct position.
2. Align the holes in the pedestals with the holes in the floor - use the four metal pins supplied with the system for this purpose.

WARNING

Pinch Hazard—Fingers can be caught in close clearances between the screw jacks, gantry, and floor.

3. Lower the Gantry to the floor evenly from all sides. Make sure that all holes are aligned.

NOTE

Do not release the weight of the Gantry from the rollers as yet.

4. Insert the four M10 bolts and washers into the holes, and turn them inwards two or three turns to fix them securely in place. It may be necessary to adjust the position of the Gantry in order to insert all four bolts.
5. Release the weight of the Gantry from the rollers of the transport devices by turning the spindles counterclockwise (CCW).
6. Fix the Gantry to the floor by closing the four bolts with a torque of 50 Nm, using a 8 mm Allen socket and a torque wrench.
7. Test whether the Gantry is firmly secured by pushing the Gantry against the upper metal housing.
8. If the Gantry wobbles, use the pedestals to support the Gantry.

   If you need to extract a pedestal:

   a. Remove the anchoring bolt.
   b. Turn the pedestal CW using the 14 mm Allen socket, until it protrudes from the base and makes contact with the floor.
   c. Re-insert the anchoring bolts, and tighten them with a torque of 50 Nm.

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NOTE

The pedestals should not be used to bear the entire weight of the Gantry. They are intended to be used as a levelling base to support the Gantry when the floor is slightly uneven.

9. Verify that the Gantry is level, by placing a level on the vertical metallic part of the legs. If necessary, level it by placing the shims supplied with the system under the frame of the Gantry. Do not place the shims under the pedestals.

Removing the Transport Device

When the Gantry is stable and satisfactorily positioned:

1. Detach the transport device as follows:
   a. Use a 10mm Hex Bit socket and ratchet to remove the four attachment screws from the transport device.
   b. Use a 14mm Hex Bit socket and ratchet to turn the four centering screws until they are released from the receiving holes in the Gantry base.
   c. Move the transport device away from the Gantry.
   d. Repeat steps 1.a. through 1.c. to remove the second transport device.
2. Remove both transport devices from the room.

Anchoring the Patient Table

Installing the Connection Piece

The Connection Piece attaches the Gantry and the Patient Table, and is located between them. It must be centered relative to the base of the Gantry.

NOTE

The Connection Piece must also be positioned so that the ground screw faces the Patient Table, as shown in *Figure 5-3*.

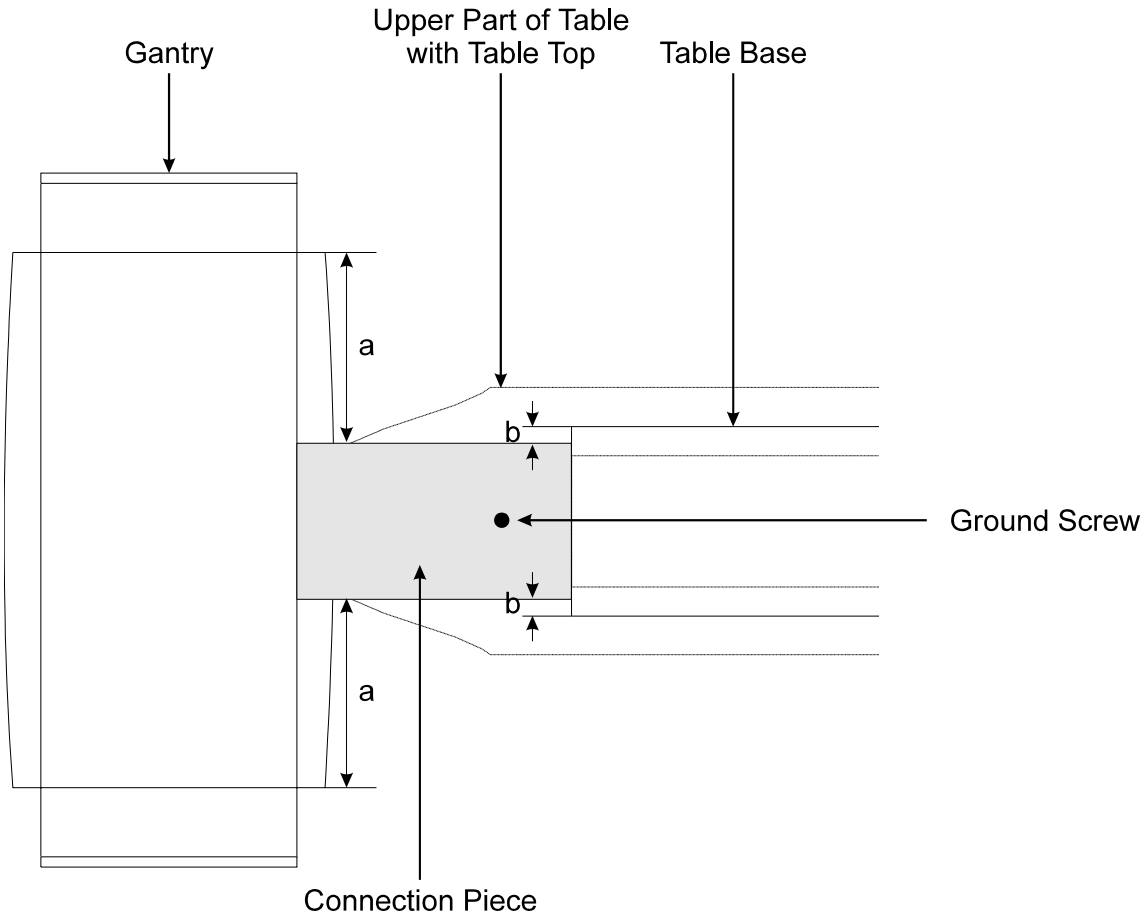

Figure 5-3: Correct Position for Connection Piece

Positioning the Connection Piece Relative to the Gantry

Position the Connection Piece relative to the Gantry, as follows:

1. Pull the five cables from the lower middle part of the Gantry, and pass them into the Connection Piece.
2. Center the Connection Piece relative to the Gantry.
3. Using a tape measure, measure the distance from the outer edge of each side of the Gantry to the Connection Piece (distance ***a*** in *Figure 5-3*). The distance from each side should be equal.

NOTE

The deviation from the center must not exceed 1 mm (0.04 in.).

4. When the Connection Piece is centered, secure it to the Gantry using two M10 x 30 screws and washers, and an 8 mm Allen wrench.
5. Open and raise the front cover of the Gantry.

Removing the Patient Table Transport Brackets

The Patient Table is secured with three Transport Brackets as described below and in *Figure 5-4*.

- All Transport Brackets are painted in red.
- Two Transport Brackets, the Table Top Transport Bracket and the Top Support Transport Bracket, secure the Patient Table horizontally during transport.
- The third Transport Bracket, the Vertical Transport Bracket, secures the Patient Table vertically during transport.

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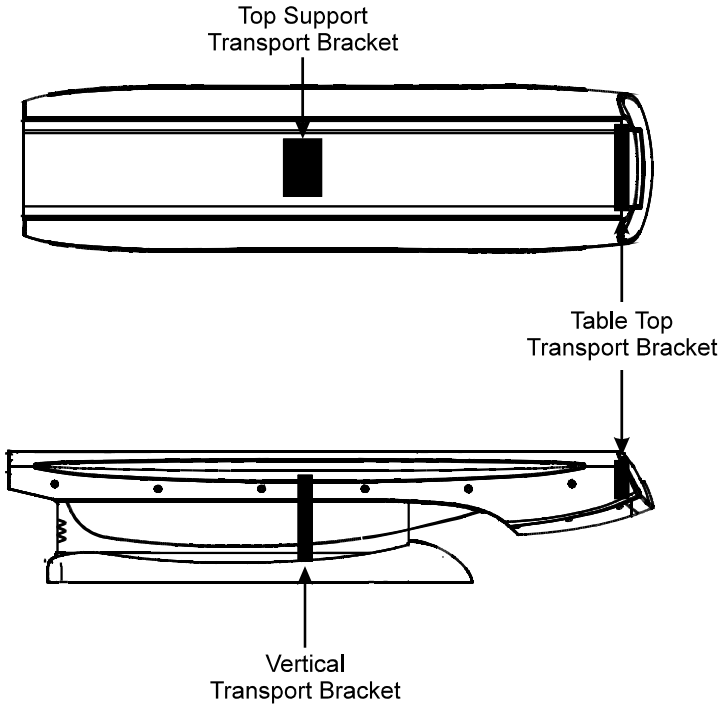

Figure 5-4: Position of the Transport Brackets

Remove the Transport Brackets, as follows:

1. Lift the bellows and remove the bolt in the upper part of the Transport Bracket that secures the Vertical Transport Bracket to the Patient Table, using a 5 mm Allen key.

   The Vertical Transport Bracket is indicated in *Figure 5-5* without the bellows.

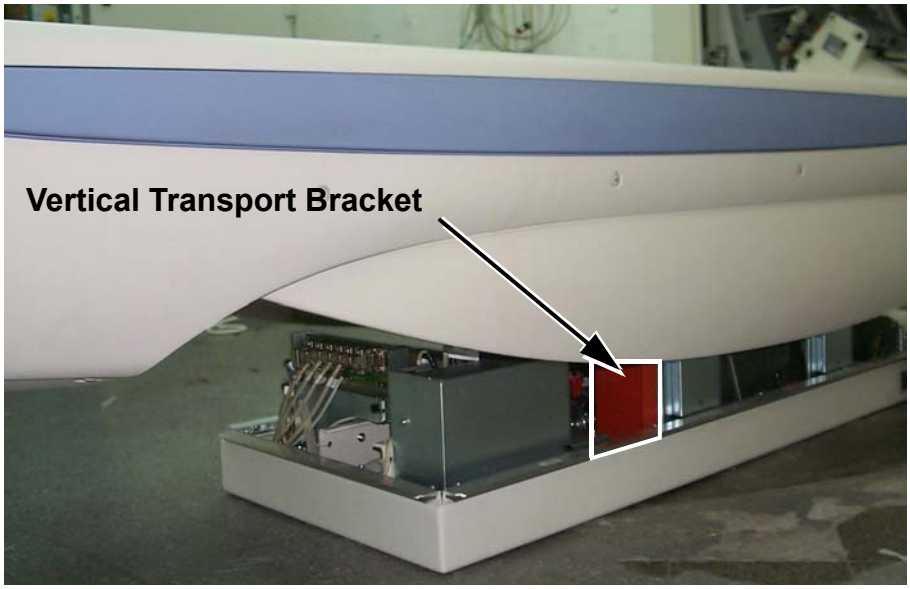

Figure 5-5: Vertical Transport Bracket (shown without the bellows)

NOTE

Do not raise the Patient Table until you have released the Vertical Transport Bracket.

2. Attach a 13 mm socket to the motor axis of the Patient Table as indicated in *Figure 5-5*.

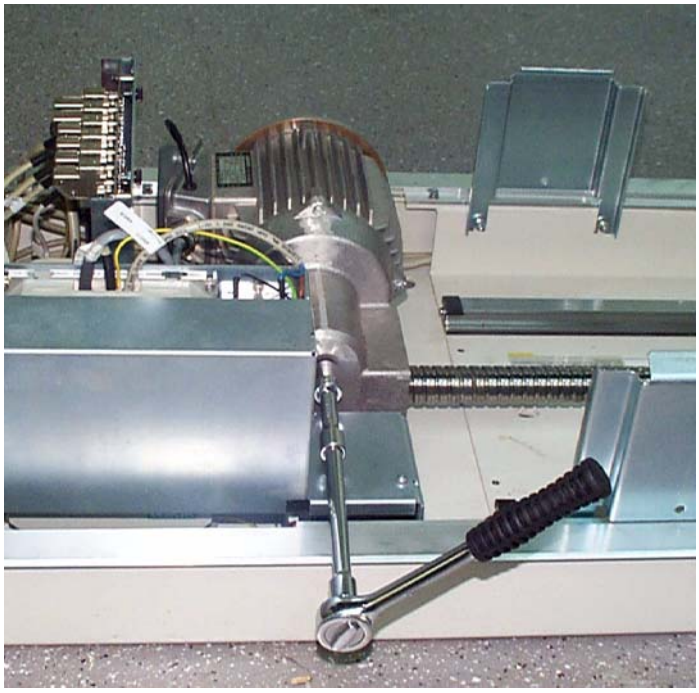

Figure 5-6: Motor Axis with Ratchet and 13mm Socket (shown without bellows)

3. Raise the Patient Table by turning the axis of the motor counterclockwise (CCW), until the Patient Table reaches a height of approximately 1000 mm (39 in.), using a ratchet and a 13 mm socket. Measure the height of the Patient Table from the floor to its top edge.

NOTE

Do not raise the Patient Table to the mechanical endstop.

4. Release the two screws that secure the Vertical Transport Bracket to the base of the Patient Table, using a 5 mm Allen key, and remove the Vertical Transport Bracket.
5. Remove the rear cover of the Patient Table, by removing the two screws illustrated in *Figure 5-7*, using a 2.5 mm Allen key.

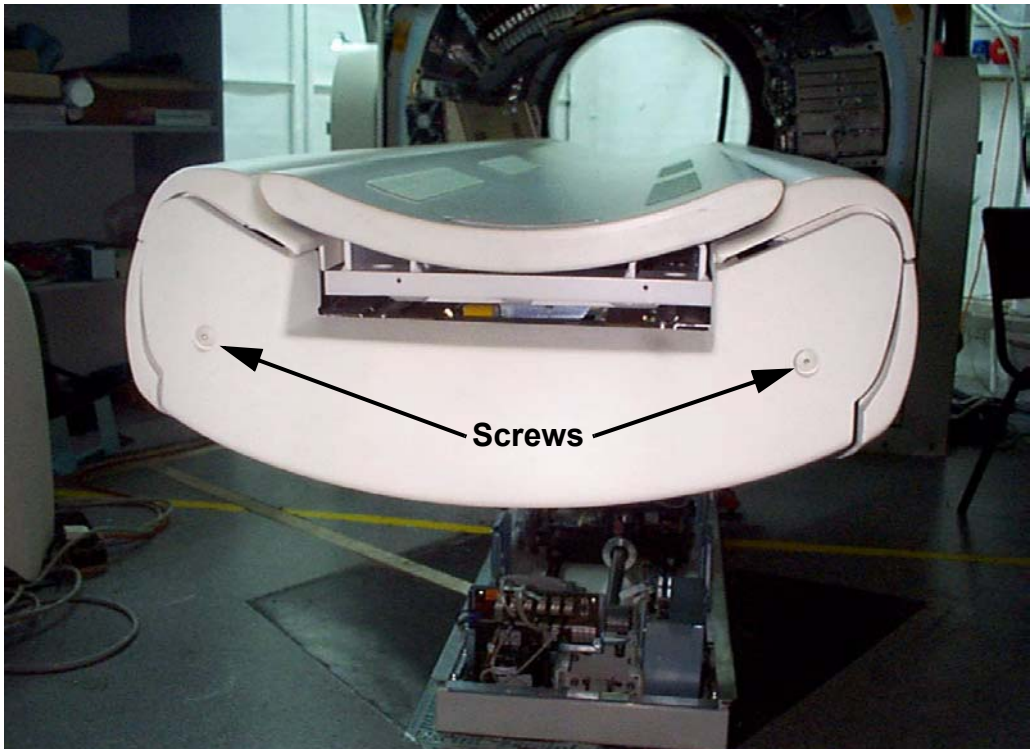

Figure 5-7: Rear Cover of Patient Table

6. Remove the Table Top Transport Bracket (*Figure 5-8*) from the Patient Table (four screws/M4), using a 3 mm Allen key.

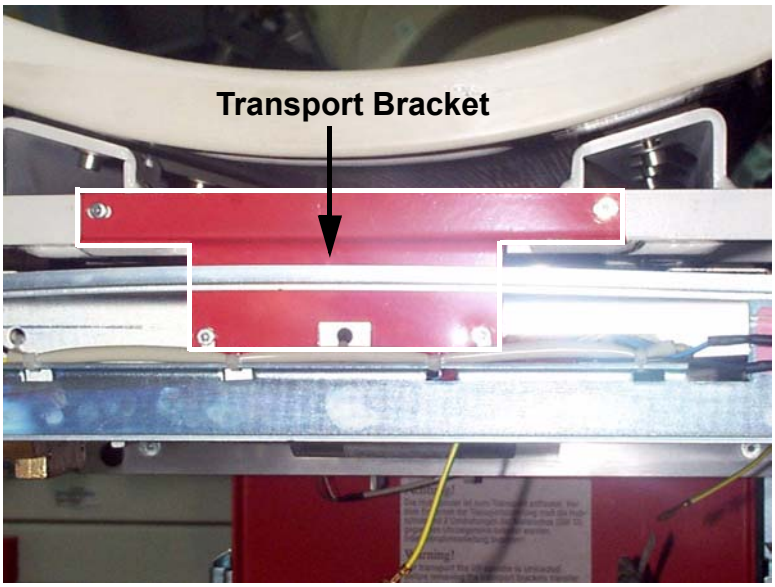

Figure 5-8: Table Top Transport Bracket (rear view)

7. Slide the table top (stretcher) towards the Gantry until the second Transport Bracket, the Top Support Transport Bracket, is visible, as shown in *Figure 5-9*.

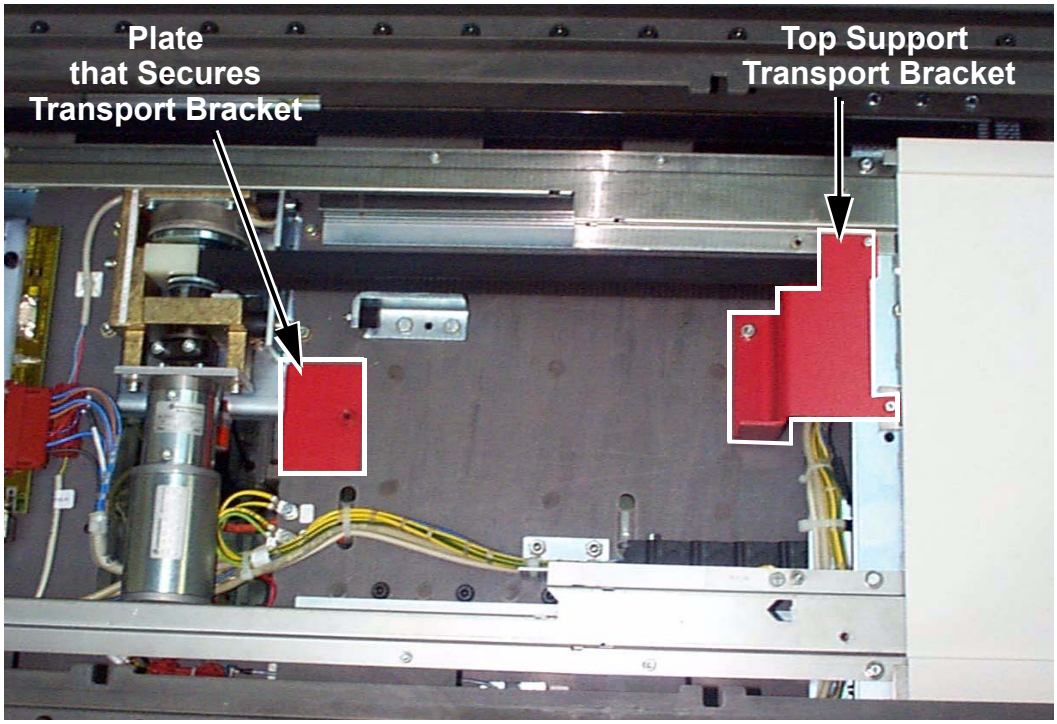

Figure 5-9: Top Support Transport Bracket (Top View)

8. Remove the red nut and the plate used to secure the Vertical Transport Bracket.
9. Use the 3 mm and the 5 mm Allen keys to remove the Top Support Transport Bracket (shown in *Figure 5-9*).
10. Slide the Table Top out of the Gantry.

Marking the Anchoring Holes for the Patient Table

If you have not prepared the holes for anchoring of the bed by using the Couch Mylar template as described in *"Tools & Auxiliary Materials Required for Installation" on page 1-2* drill them according to the procedure explained in this section.

Position the Patient Table relative to the Connection Piece, as follows:

1. Carefully move the Patient Table towards the Connection Piece until they touch, and center the Patient Table relative to the Connection Piece. See distance ***b*** in *Figure 5-3*.

NOTE

Be careful not to damage the connectors that extrude from the Patient Table.

2. Using a tape measure, measure the distance from the outer edges on each side of the table base to the Connection Piece (distance b in *Figure 5-3*).

NOTE

The deviation from the center must not exceed 1 mm (0.04 in.).

3. When the Patient Table is centered with respect to the Connection Piece, proceed as follows:
   a. Lower the front end of the Patient Table (the end nearest the Gantry), by rotating the bolts on both the front rollers counterclockwise (CCW), using a 13 mm Hex socket.
   b. Lower the foot of the Patient Table by turning the nuts of the third roller counterclockwise (CCW), the same number of turns, using a 10 mm Hex socket, until the weight of the Patient Table is no longer on the roller.
   c. Leave the transport rollers attached to the Patient Table.
4. Verify that the Patient Table is centered with respect to the Connection Piece, using a tape measure. If necessary, make the required adjustments to center it.

NOTE

The deviation from the center must not exceed 1 mm (0.04 in.).

5. To ensure that the Patient Table is centered with respect to the Gantry, measure from each corner of the table top (stretcher) to the frame of the Gantry (indicates tape measure position on Gantry), as shown in *Figure 5-10* and *Figure 5-11*. If necessary, move the Patient Table until it is centered.

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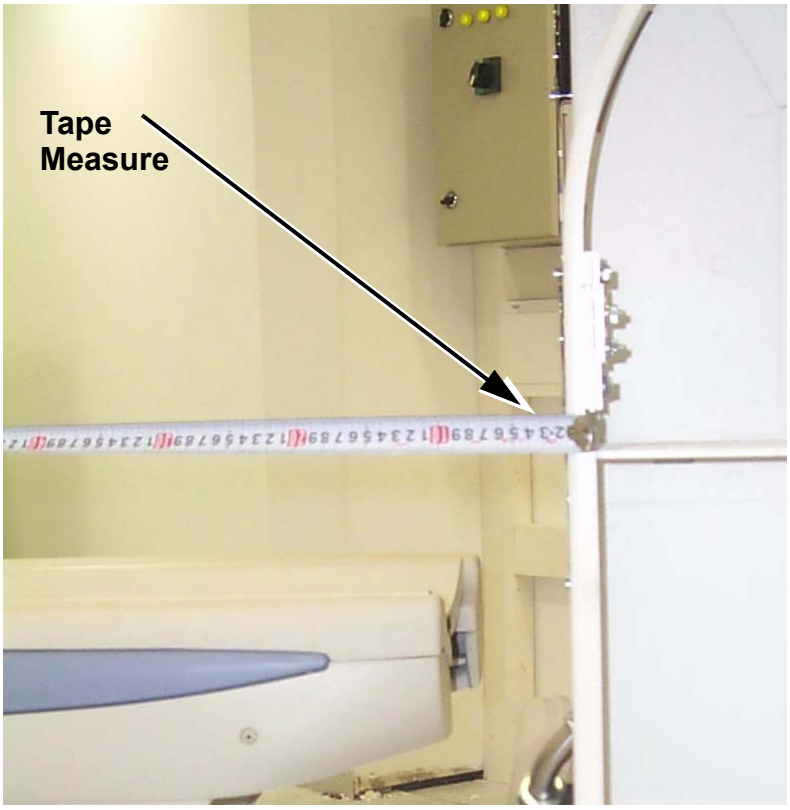

Figure 5-10: Tape Measure Position on Gantry

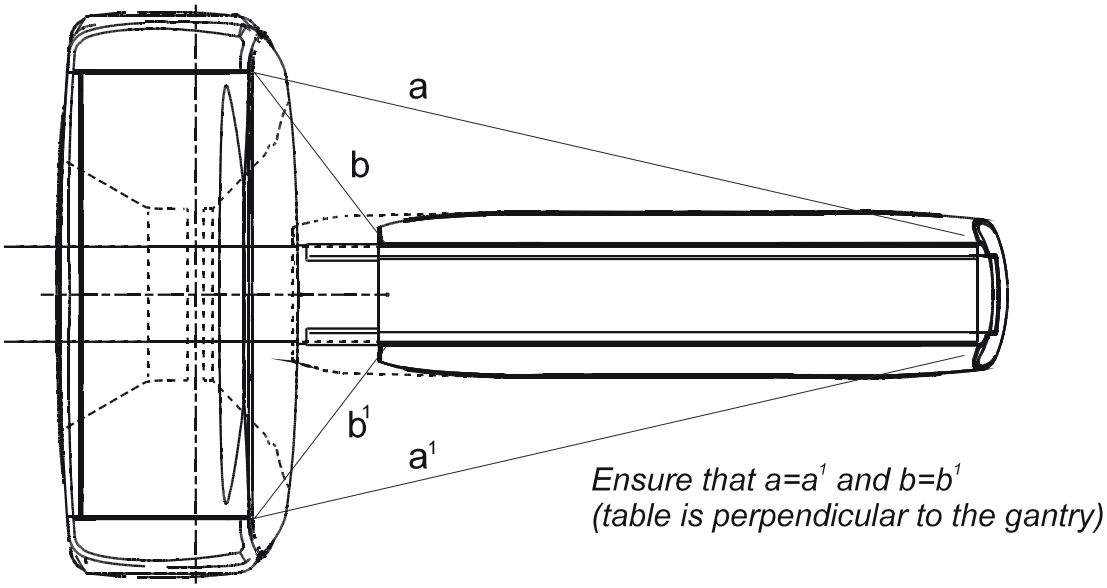

Figure 5-11: Distances to Measure to Center the Patient Table

6. Mark the five holes for anchoring the Patient Table (shown in *Figure 5-12*). To mark the rear hole, remove the rear transport wheel by opening the two nuts. Mark the position of the rear hole approximately in the center of the square hole for the wheel. When you are done, replace the rear transport wheel.

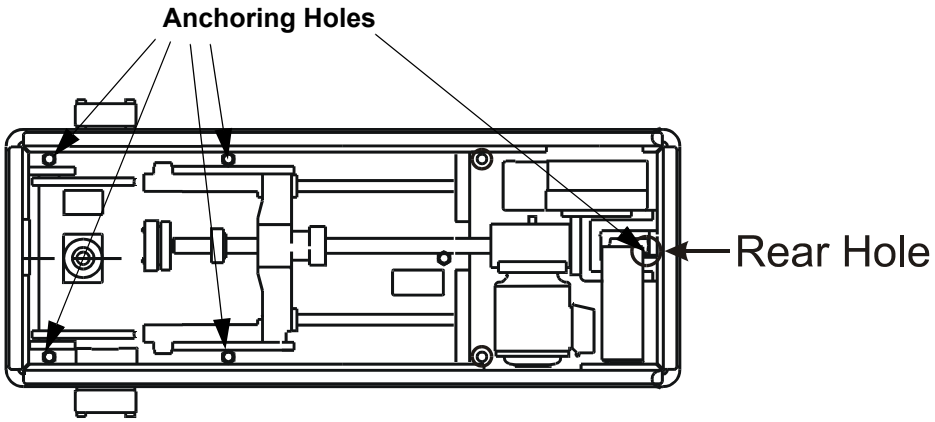

Figure 5-12: Location of Anchoring Holes

Drilling the Holes

The installation materials included with the Mx8000 system are for anchoring the Patient Table to a floor made of concrete.

NOTE

To anchor the Patient Table to other types of floors, purchase the appropriate installation materials locally.

To drill the holes that anchor the Patient Table do the following:

1. Loosen and remove the screw that fixes the Connecting Piece to the Patient Table.
2. Raise the Patient Table on the three rollers by turning the screws of the two side rollers and the nuts of the centered roller clockwise (CW).
3. Roll the Patient Table aside.
4. Drill the five holes for the anchors in the exact positions of the markings made for this purpose, as follows:
   a. Drill the five holes using a 6 mm drill bit to a depth of 85 mm (3 in.).
   b. Widen them with a 10 mm drill bit.
   c. Use the 14 mm drill bit (supplied with the system) and drill to a depth of 93 mm (max 95 mm).
   d. Remove the dust with the vacuum cleaner.

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Installing the Anchors

Insert the anchors supplied with the system into the five holes, as follows:

1. Insert the anchor into the hole.
2. Use the punch supplied to punch the anchor into the hole until it is below the level of the floor.
3. Using an 8 mm Allen socket and a torque wrench, tighten the anchor with a torque of 25 Nm.
4. Repeat steps *1* through *3* to install the remaining four anchors.

Positioning the Patient Table

To position the Patient Table:

1. Place the Patient Table over the holes in the floor.
2. Lower the Patient Table to the floor by turning the screws of the rollers counterclockwise (CCW) until the weight of the table is off the rollers.
3. Ensure that the Patient Table is centered with respect to the Connecting Piece as follows:
   a. Measure the distance from the outer edge of each side of the patient table base to the Connecting Piece using a tape measure.
   b. Make any adjustments necessary if the distances are not exact.

NOTE

The deviation from the center with respect to the Gantry must not exceed 1 mm.

4. Secure the Patient Table to the Connecting Piece with two M10 x 30 screws.
5. Ensure that the frame of the table lies completely flat on the floor. If necessary, use the plates included with the shipment as shims.
6. Place a level on the aluminum profile at measurement point 1 (see *Figure 5-13*) to determine whether the table is level lengthwise.

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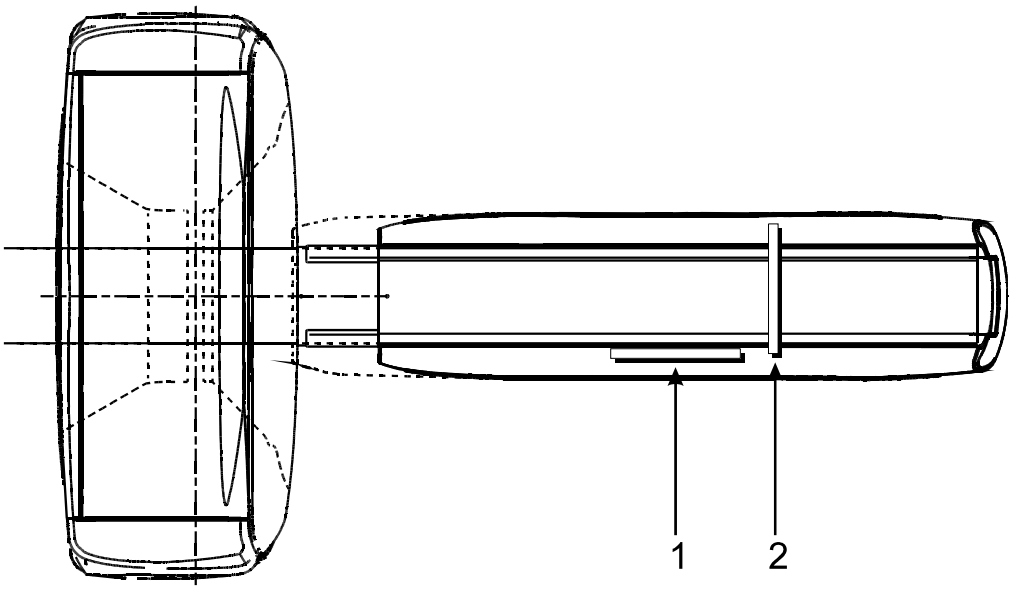


Figure 5-13: Leveling the Patient Table

7. Slide the Table Top and the Top Support Bracket into the Gantry until they reach the endstop.
8. Place a level at measurement point 2 (see *Figure 5-13*) to measure whether the table is level, in the width.
9. To ensure that the Patient Table is centered with respect to the Gantry, measure from each corner of the table top (stretcher) to the frame of the Gantry, as shown in *Figure 5-14*.

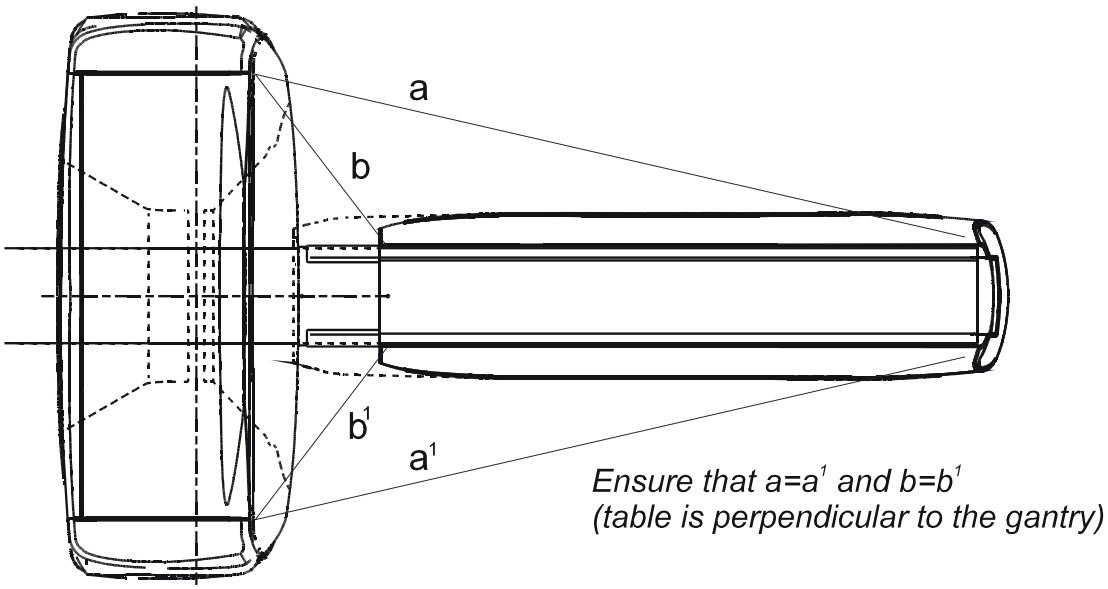


Figure 5-14: Distances to Measure to Center the Patient Table

Removing the Transport Rollers

Remove the two side Transport Rollers first, and then the third Transport Roller.

1. Remove the side Transport Rollers from the Patient Table as described below:
   a. Remove the two screws that attach the rollers to the Pillars, using a 13 mm Hex socket.
   b. Unscrew the two Pillars and remove them.
   c. Loosen the two screws that secure the bracket to the table base, using a 5 mm Allen socket.
   d. Remove the bracket.

NOTE

The screws that attach the brackets will be needed later to secure the Service Switch Panel and the Fuse Panel to the base of the Patient Table.

2. Loosen the two nuts attaching the third roller and remove it, using a 10 mm Hex socket.

   Notice that the two screws remain attached to the base of the Patient Table.

Bolting the Patient Table to the Floor

Bolt the Patient Table to the floor, as follows:

1. Insert the four front M8 locking screws with the semi-circular washers into the four corresponding front locking holes. See *Figure 5-15*.

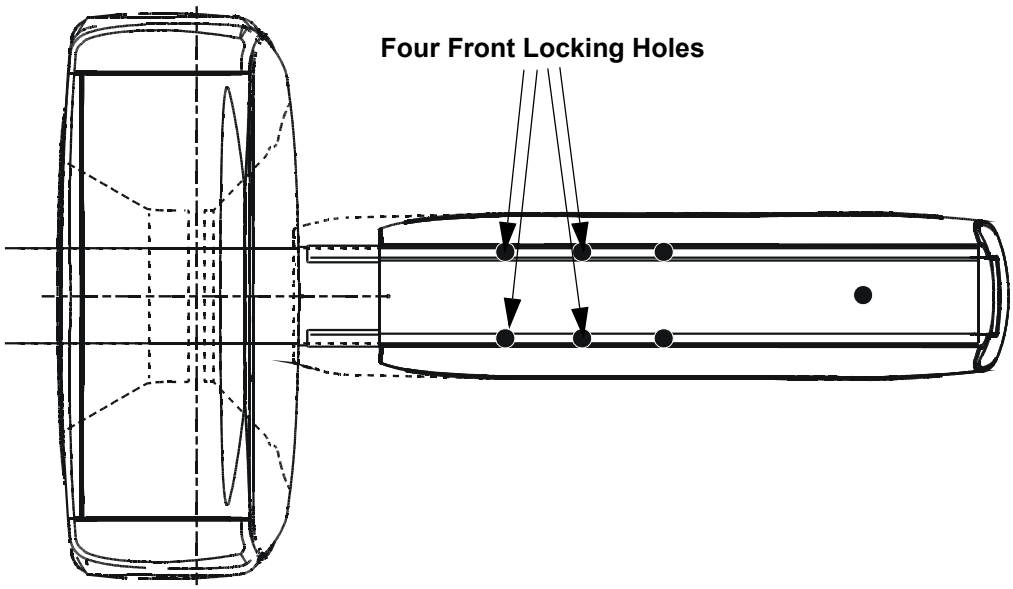


Figure 5-15: Locking Holes in Base of Patient Table

2. Ensure that the scissors do not touch the washers during vertical movements. See *Figure 5-16*.

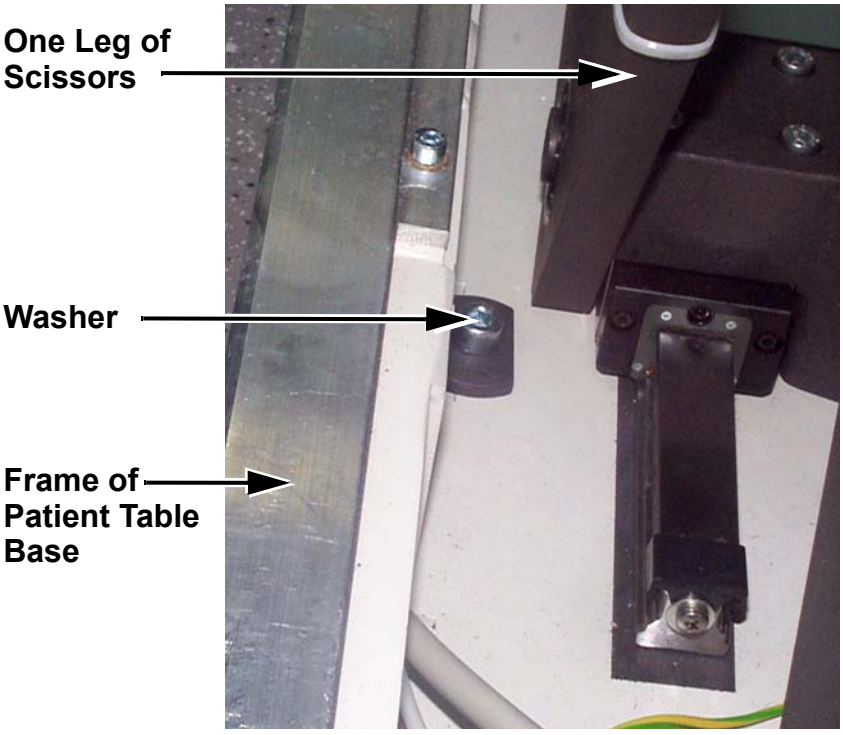


Figure 5-16: Washers in Patient Table Base

3. Insert the rear locking screw through the metal U-rail as shown in *Figure 5-17*.

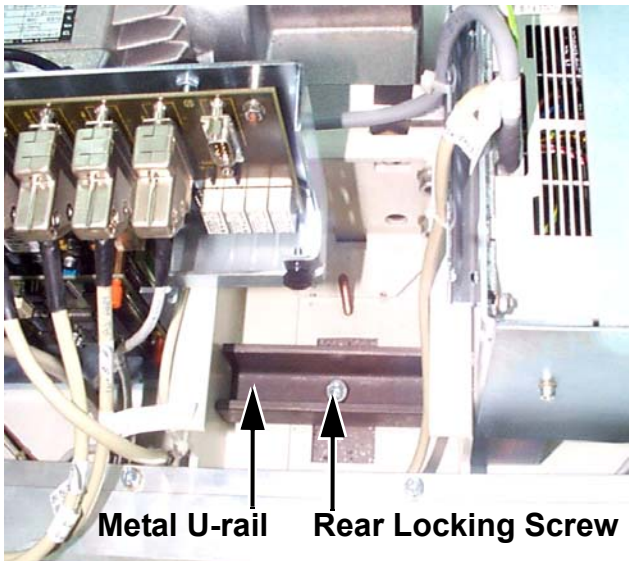


Figure 5-17: Rear Locking Screw of the Patient Table

NOTE

Do not tighten the screws as yet. The final position of the Patient Table will be decided later using a water phantom.

Installing the Fuse Panel and the Service Switch Panel

Use the screws that attached the Transport Brackets to the base of the Patient Table (see "Removing the Transport Rollers" on page 2-19) to fix the Fuse Panel and the Service Switch Panel to the base of the Patient Table, as follows:

1. Cut the cable ties that attach both panels to the base of the table, and set them aside.
2. Remove the upper cover of the Fuse Panel by opening the two screws.
3. Position the Fuse Panel on the inner side of the frame.

   The Fuse Panel is on the front left side of the Patient Table, as shown in *Figure 5-18*.

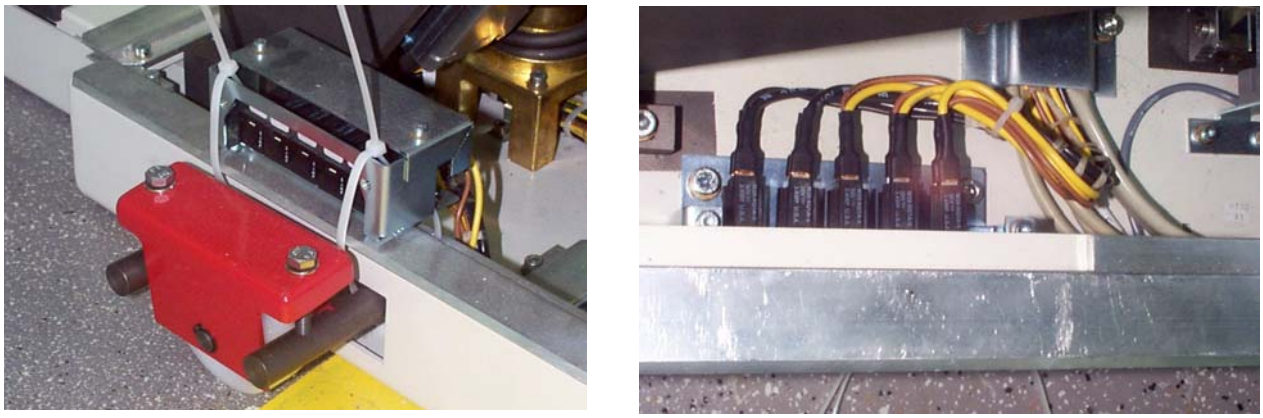


Figure 5-18: Fuse Panel

4. Secure it in place using two of the screws that you saved when you removed the Transport Rollers.
5. Loosen the screws of the Cable Bracket (*Figure 5-19*), using a 5 mm Allen socket, and pull or push the cables toward the inside of the table, keeping the bend in the cables to a minimum.

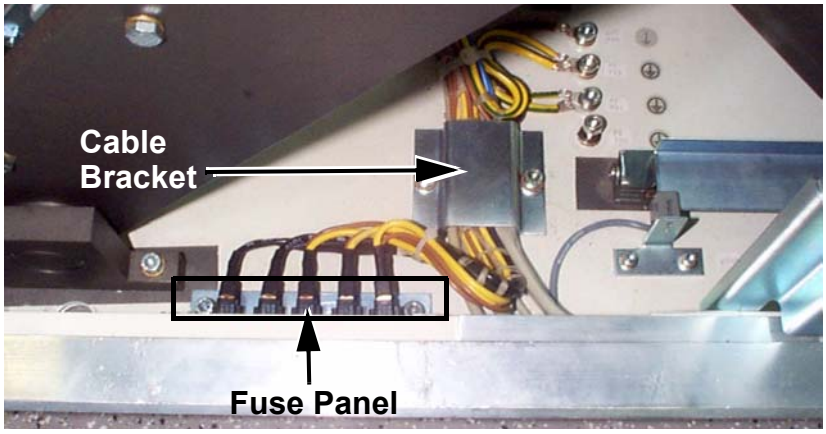
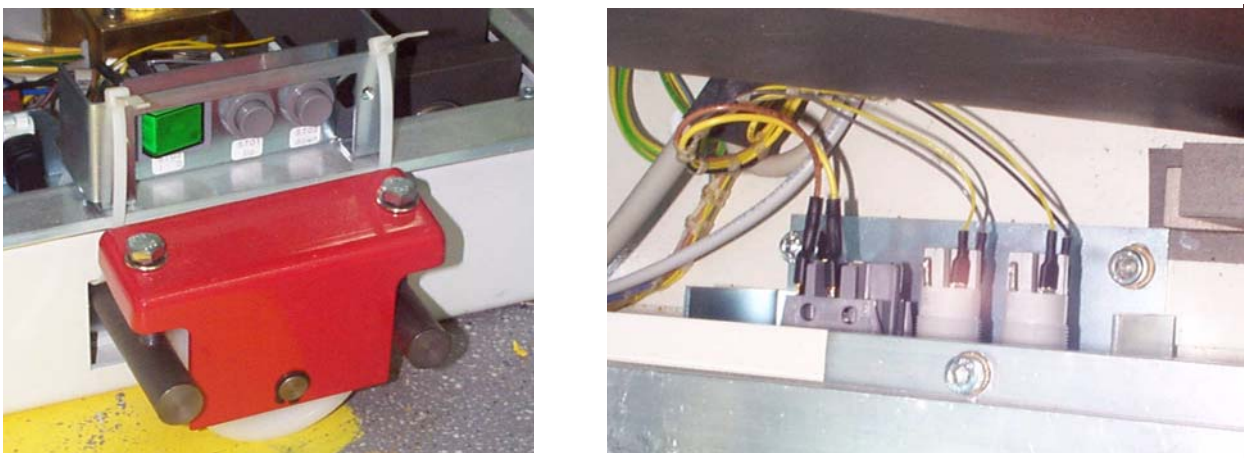


Figure 5-19: Cable Bracket

6. Tighten the screws of the Cable Bracket.
7. Replace the upper cover of the Fuse Panel.
8. Repeat steps *3* through *4* to position and secure the Service Switch Panel.

   The Service Switch Panel is on the front right side of the Patient Table, as shown in *Figure 5-20*.



Uninstalled Installed

Figure 5-20: Service Switch Panel

NOTE

Make sure that the cables do not get damaged when the table is lowered.

Anchoring Secondary System Components

Secondary system components such as the Power Distribution Cabinet (PDC) and the Operator Console need not be anchored to the floor unless required by local regulations. This section describes how to bolt the following units to the floor, in the order listed:

- PDC and Heat Exchanger (same procedure for both)
- Operating Console

Anchoring the PDC and the Heat Exchanger

NOTE

It is ***recommended*** to bolt the cabinets to the floor using the hole pattern indicated **(*1** in *Figure 5-21* and *Figure 5-22*) after connecting all the cables and water pipes. Holes for anchor bolts are provided; however, the ***customer is responsible*** for supplying installation materials.

Positioning the Floor Anchors

See *Figure 5-21* and *Figure 5-22* to aid in positioning the floor anchors for the PDC and Heat Exchanger. These figures depict the anchor hole pattern used for the PDC Base and the Water to Water (*Figure 5-21*) and Water to Air (*Figure 5-22*) Heat Exchanger Bases. It is *not necessary* to bolt the PDC or the Heat Exchanger to the floor unless required by local or national regulations, e.g., in areas prone to earthquakes.

Two methods are recommended to position the PDC and Heat Exchanger floor anchors:

Method #1:

1. Position the PDC and Heat Exchanger Cabinets in their respective final installation positions.
2. Remove the four nuts from the bolts that attach the secondary component's base to the pallet (at each corner inside the cabinet base) with a 17 mm open–end wrench. Remove the plastic pins that cover the bolts and remove both the bolts and lower side covers of the cabinet to gain access to the nuts.
3. Identify the holes of the respective secondary component's base corresponding to the anchor holes (shaded) in *Figure 5-21* or *Figure 5-22*.
4. Mark the floor with the outline of the four anchor holes in each base plate with a permanent, sharp–tipped marker.
5. Move the PDC and Heat Exchanger cabinets from their respective final positions to expose the floor markings.

Method #2:

1. Determine the final installation positions for the PDC and Heat Exchanger.
2. If additional access to the secondary component's base is desired, remove the four nuts from the bolts that attach the secondary component's base to the pallet (at each corner inside the cabinet base) with a 17 mm open–end wrench. Remove the plastic pins that cover the bolts and remove the bolts and lower side covers of the cabinet to access the nuts.
3. Transfer the bolt pattern from *Figure 5-21* and/or *Figure 5-22* to the floor in the final installation positions of the PDC and Heat Exchanger.

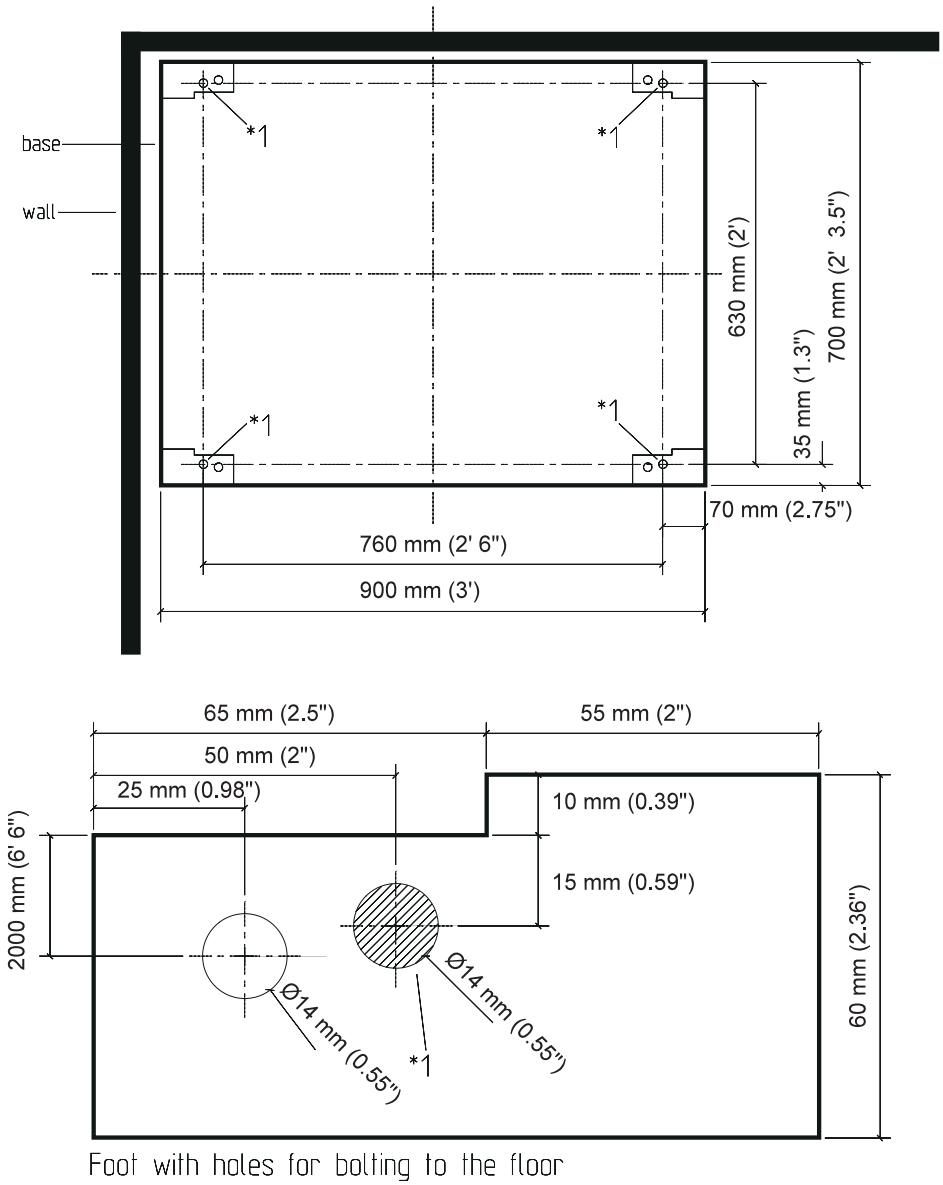


Figure 5-21: PDC and Water-water Heat Exchanger

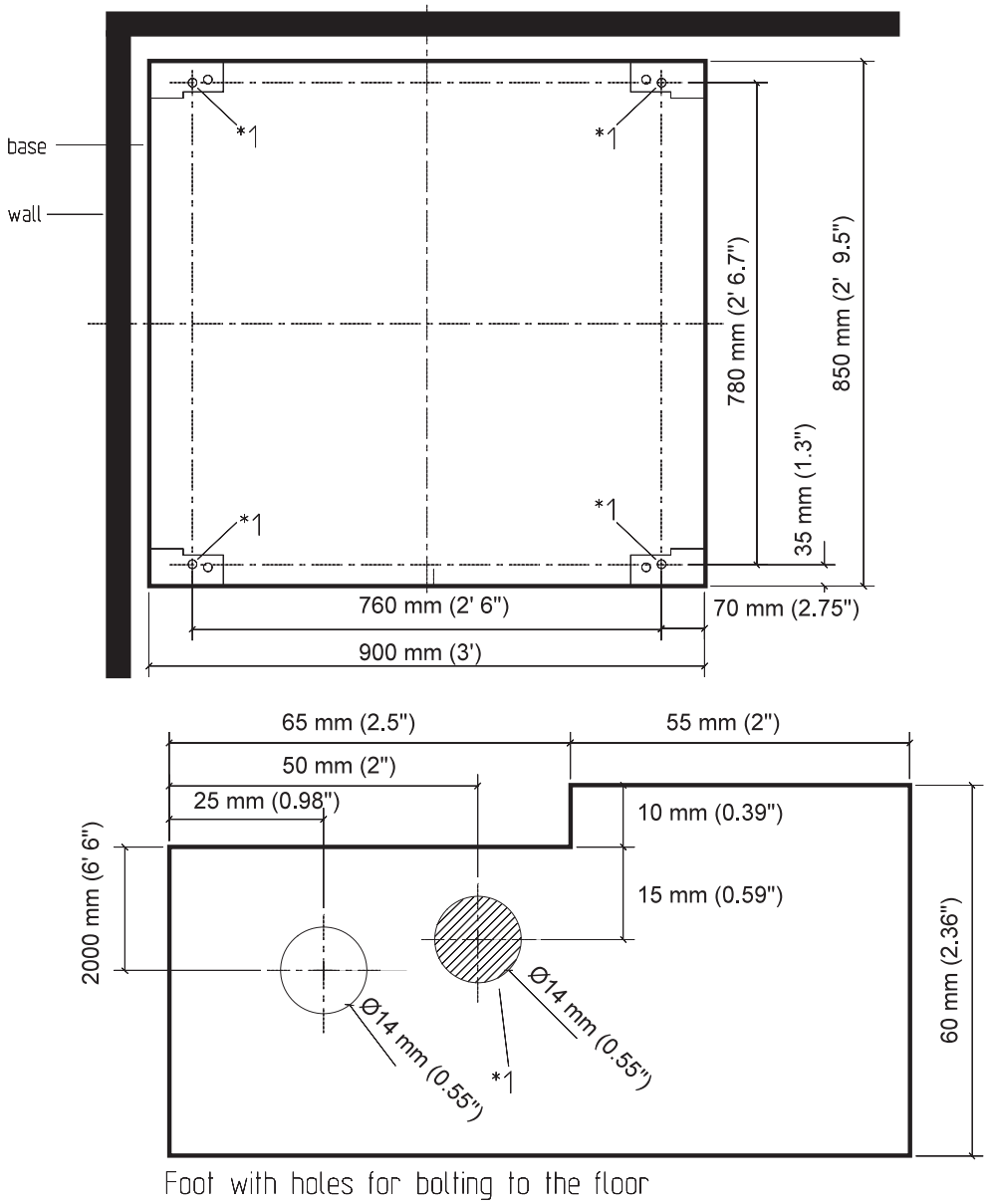


Figure 5-22: Water-air Heat Exchanger

Drilling the Anchor Holes

NOTE

Floor anchors for the PDC and Heat Exchanger are not supplied with the system and must be obtained locally. **The customer's engineer of record must specify the appropriate floor anchor based on local regulations.**

1. Determine the specifications of the holes required for the floor anchors (drill bit diameter, hole depth and installation tools).
2. Refer to the section entitled *"Drilling the Holes"* and follow the procedure. Substitute all hole specifications determined by the customer's engineer of record for those listed in the procedure.

Installing the Anchors

Refer to the section entitled *"Installing the Anchors" on page 5-17* and follow the procedure.

Anchoring the PDC and Heat Exchanger

1. Position the PDC and Heat Exchanger in their respective installation position.
2. Align the anchor holes in each base with the floor anchors.
3. Insert a bolt with a washer and lock washer through each of the anchor holes in the base and into the floor anchor. Use the hardware specified by the customer's engineer of record.
4. Thread each bolt into its floor anchor with the appropriate tool.
5. Torque each bolt as specified by the customer's engineer of record.

Anchoring the Operating Console

It is not necessary to bolt the Operating Console to the floor unless required by local or national regulations. If required, refer to *Figure 5-23* for details.

Make sure that the legs of the table are firmly secured to the floor by means of clamps as shown in *Figure 5-23*. (You can use the clamps that were used to secure the table during transportation.)

NOTE

All materials that are used to bolt the table of the Operating Station to the floor must be purchased locally.

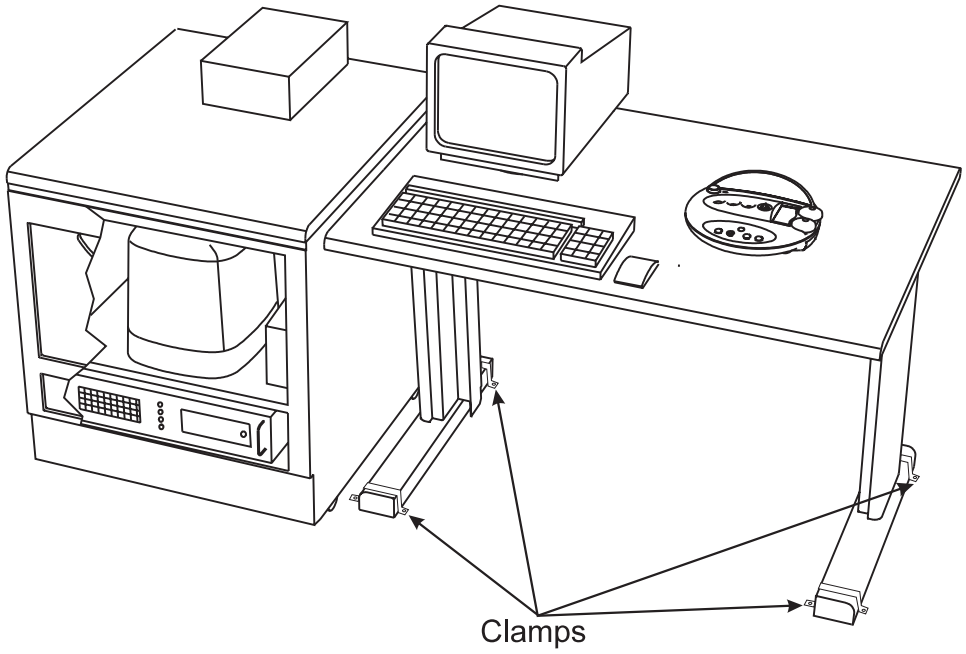


Figure 5-23: Front of Operating Console Table

1. Place the Operator's Console in its final installation position.
2. Retrieve the four metal brackets that secured the Operator's Console to its shipping pallet. Refer to the section titled *"The Operating Console"* and the **note** on page *4-26* in "Unpacking and Positioning System Components".
3. Position a bracket 5cm (2") from the front and rear edges of each floor support.
4. Ensure the metal brackets are properly positioned to "capture" the floor support and mark the position of the anchor holes on the floor with a sharp–tipped permanent marker.

5. Move the Operator's Console from its final installation position to expose the marked anchor hole positions.

Drilling The Anchor Holes

NOTE

Floor anchors for the Operator's Console are not supplied with the system and must be obtained locally. **The customer's engineer of record must specify the appropriate floor anchor based on local regulation**s.

1. Determine the specifications of the holes required for the floor anchors (drill bit diameter, hole depth and installation tools).
2. Refer to the section entitled *"Drilling the Holes"* and follow the procedure. Substitute all hole specifications determined by the customer's engineer of record for those listed in the procedure.

Installing The Anchors

Refer to the section entitled *"Installing the Anchors" on page 5-17* and follow the procedure.

Anchoring The Operator's Console

1. Position the Operator's Console in its installation position.
2. Position the metal brackets to "capture" the Operator's Console floor supports and align the floor support and bracket assembly with the floor anchors.
3. Insert a bolt with a washer and lock washer through each of the anchor holes in the metal brackets and into the floor anchor. Use the hardware specified by the customer's engineer of record.
4. Thread each bolt into its floor anchor with the appropriate tool.
5. Torque each bolt as specified by the customer's engineer of record.

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Chapter 6
Connecting System Components

This chapter describes how to connect the components of the Mx8000 to water and electricity.

It includes the following sections:

- Connecting the chilled water system.
- Connecting the air hoses.
- Filling the water system.
- Electrical connections including: routing cables, connecting the Gantry, connecting the Patient Table, connecting the Heat Exchanger, connecting the PDC, the Operating Station, and the Computer Rack.

Connecting the Coolant System

You can route the hoses into the cabinet of the Heat Exchanger from all four sides. If additional access is required for routing the coolant hoses, the remaining base covers may be removed. Refer to *Figure 4-22* and step *4c* on page *4-22*. To connect the chilled water system, you need only two crescent wrenches, 36 and 41 mm. Do not use any other wrenches.

NOTE

- Two open–end wrenches, 36mm and 41mm, are required to connect the coolant hoses. Do not use any other wrenches.
- The minimum bend radius for the water hose is 150mm.
- *Figure 6-1* was taken after a completed installation. Some connections shown will not be present at this point in the installation.

CAUTION

Use both wrenches when tightnening the nuts of the coolant hoses. Use one wrench to tighten the nut and the other for counter pressure. Using counter pressure will ensure that all connections are tightened properly (see *Figure 6-1* and *Figure 6-4*).

Connecting The Secondary Cooling System

Gantry Right Leg Connections

Connect the secondary cooling system within the Gantry Right leg as follows (See *Figure 6-1* for all steps in the following procedure):

1. Route the water supply and water return hoses that interconnect the Heat Exchanger and Gantry through the floor trough. Position the water hoses so the factory–installed connectors on the hoses are connected inside the right–hand column of the Gantry.
2. Slip an insulating sleeve over the factory–installed connector on each hose. Push the sleeve approximately 50cm down the hose to allow easy access to the hose connection.

NOTE

Step 3. allows for proper tightening of the water hose connections.

3. Loosen and remove the bracket that secures the electrical cable labeled X303 with a 10mm open–end wrench and remove the ground (protective) cables connected to stud PE301.
4. Connect the red–banded water hose (water return hose) to the innermost Gantry water connection labeled “Water Outlet”. Tighten the connection with the 36mm and 41mm open–end wrenches to approximately 25 ft–lbs.
5. Connect the blue–banded water hose (water supply hose) to the outermost Gantry water connection labeled “Water Inlet”. Tighten the connection with the 36mm and 41mm open–end wrenches to approximately 25 ft–lbs.

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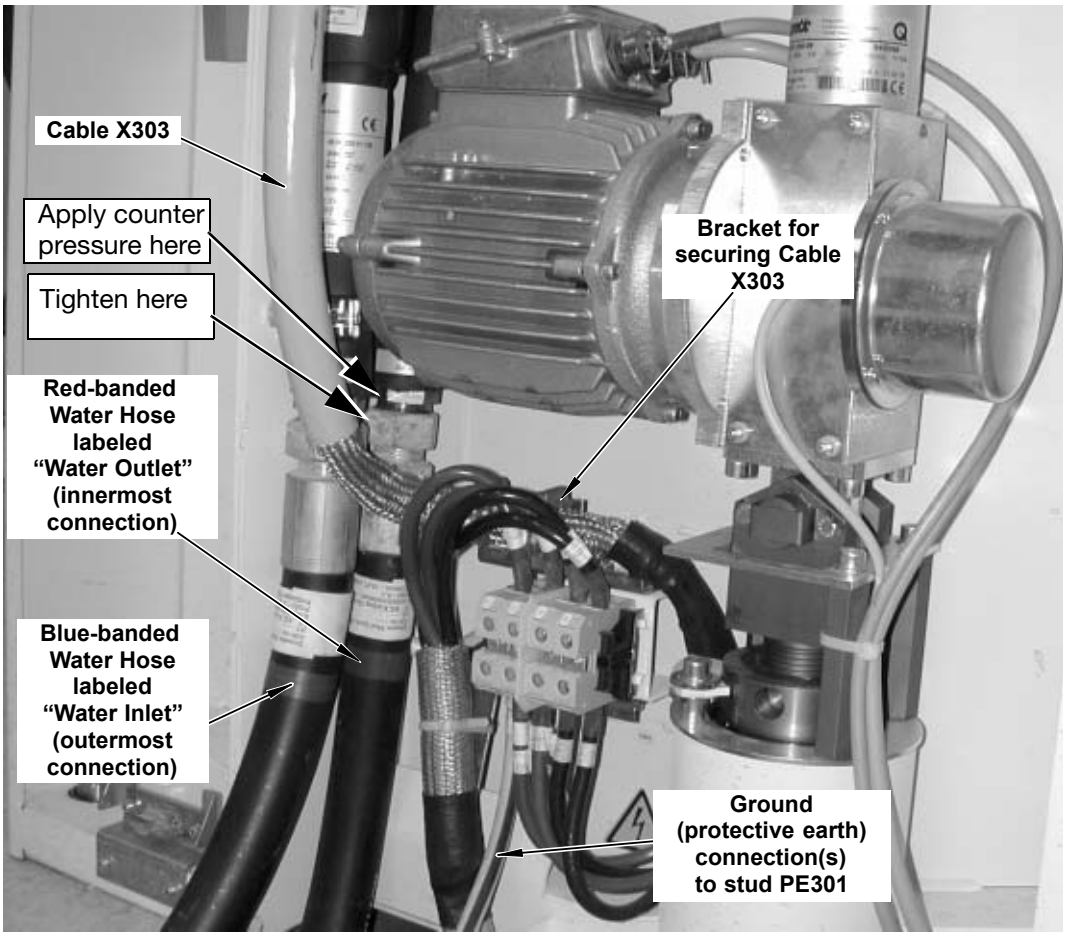
Cable X303
Apply counter pressure here
Tighten here
Red-banded Water Hose labeled "Water Outlet" (innermost connection)
Blue-banded Water Hose labeled "Water Inlet" (outermost connection)
Bracket for securing Cable X303
Ground (protective earth) connection(s) to stud PE301

Figure 6-1: Hose Connector and Chilled Water Hose Connection in the Right Gantry Leg

NOTE

Figure 6-1 was photographed after the Mx8000 was completely installed. Some connections shown here will not be present at this point during the installation.

Figure 6-2: End of Hose with Permanent Connection

6. Slide the insulating sleeves installed in step 2. up the hoses to completely cover the water connection couplings.
7. Reinstall the bracket for cable X303 and reattach the ground (protective earth) cables to stud PE301.

Heat Exchanger Connections

Connect the secondary cooling system within the Heat Exchanger as follows (See *Figure 6-3* or *Figure 6-4* for all steps in the following procedure):

1. Route the Gantry supply and return water cooling hoses into the base of the Heat Exchanger cabinet.

NOTE

The two water cooling connections in the Water to Water Heat Exchanger for the Gantry are located in the lower right section of the Heat Exchanger cabinet.
- The blue–banded hose will be connected to the water supply line. This is the connection located farthest to the right and labeled “Gantry Water Outlet”.
- The red–banded hose will be connected to the water return line. This connection is labeled “Gantry Water Inlet” and is directly adjacent to the “Gantry Water Outlet”.

2. Determine the length of each water cooling hose required to complete the connection inside the Heat Exchanger cabinet.
3. Shorten each hose to the required length with a utility or razor knife.
4. Mark or label each hose to designate it as the supply (blue) or return (red) line.
5. Attach to each hose a metallic connector supplied with the system (*Figure 6-3*) as follows:
   a. In square 1. of the illustration, make sure that the threaded end of the nut is aligned with the “O–ring” end of the nipple.
   b. In square 5. of the illustration, make sure that the four supplied spacers are inserted between the two clamp sections and are centered on the bolt holes.
   a. In square 8. of the illustration, use the 5mm hex key supplied with the clamp connector kit to tighten the bolts so that the clamps and spacers are fully engaged or until the clamps close flush against the spacers.

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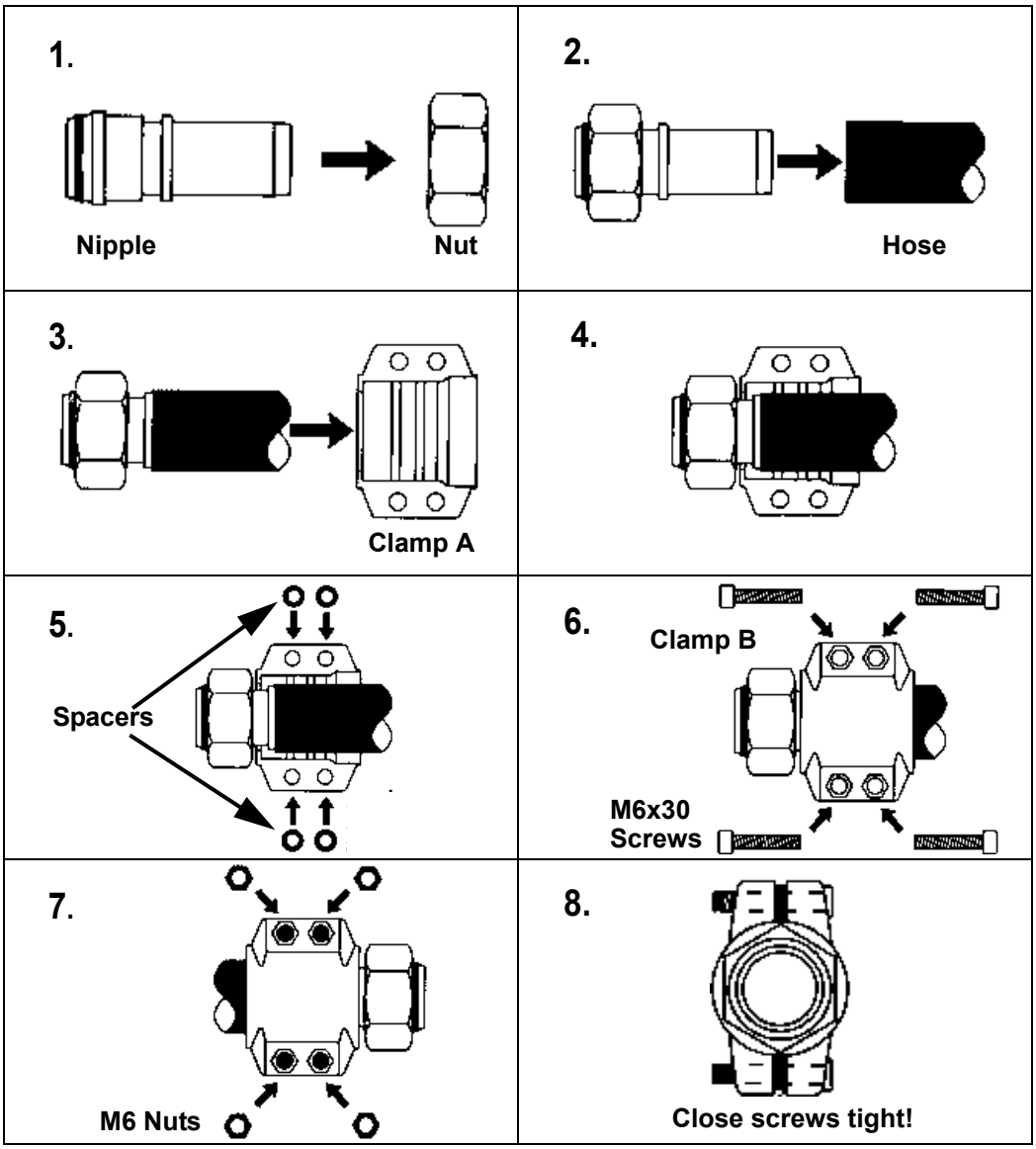

Figure 6-3: Attaching the Connection at the Heat Exchanger End of the Water Hose

6. Connect the supply and return lines of the Gantry in the Heat Exchanger cabinet (*Figure 6-4*) as follows:
   - **a.** Hand–tighten the blue–banded hose (supply line) to the connector labeled “Gantry Water Outlet”.
   - **b.** Tighten the blue–banded hose connection to approximately 25 ft–lbs with the 36mm and 41mm open–end wrenches.
   - **c.** Hand–tighten the red–banded hose (return line) to the connector labeled “Gantry Water Inlet”.
   - **d.** Tighten the red–banded hose connection to approximately 25 ft–lbs with the 36mm and 41mm open–end wrenches.

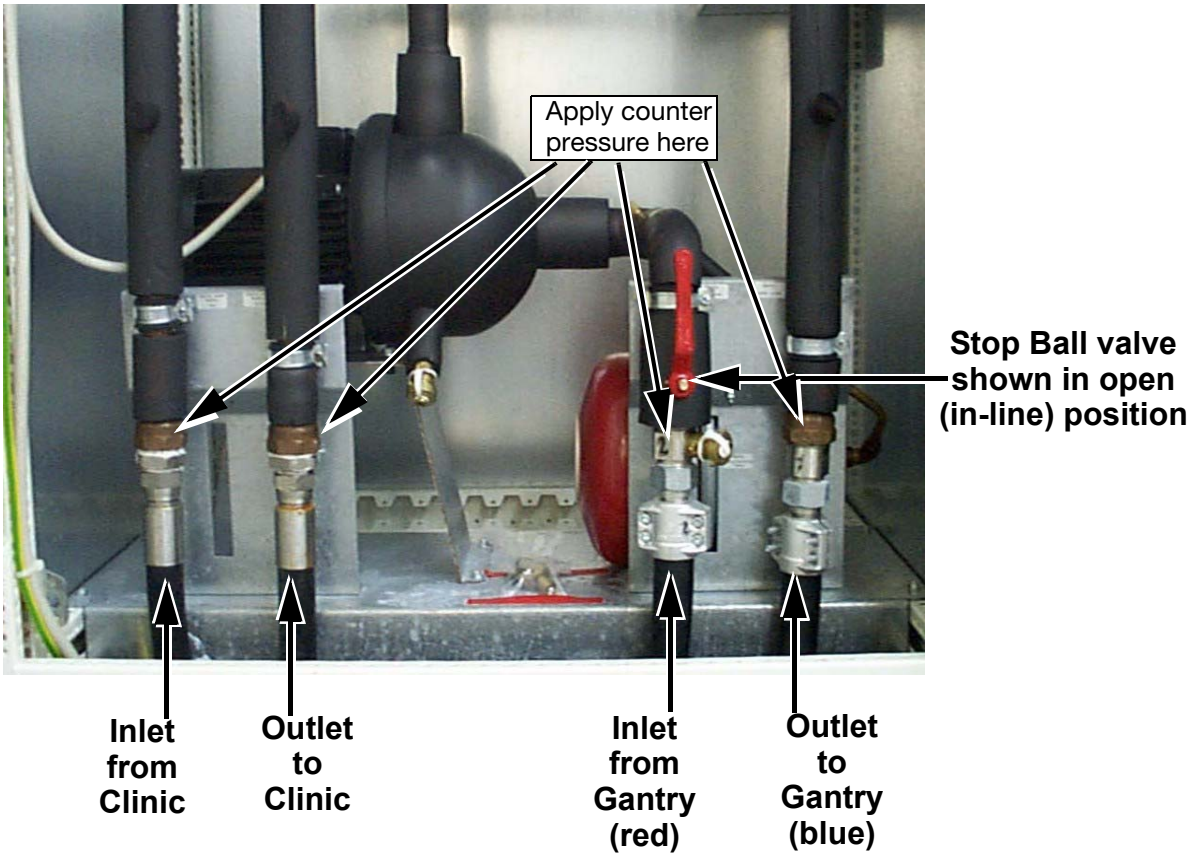
Apply counter pressure here
Stop Ball valve shown in open (in-line) position
Inlet from Clinic
Outlet to Clinic
Inlet from Gantry (red)
Outlet to Gantry (blue)

Figure 6-4: Water Hose Connections in the H. E. Cabinet

Connecting The Primary Coolant System (Water—Water Heat Exchanger Only)

NOTE

Connect the primary water hoses to the medical facility with the assistance and direction of the medical facility personnel in charge of the chilled water supply. Pay attention to the direction of the water flow as shown in *Figure 6-4*. The two water cooling connections in the Water to Water Heat Exchanger for the primary cooling hoses are located in the lower left section of the Heat Exchanger cabinet.

- The blue–banded hose will be connected to the water supply line. This is the connection located farthest to the left and labeled “Inlet from Clinic”.
- The red–banded hose will be connected to the water return line. This connection is labeled “Outlet to Clinic” and is directly adjacent to the “Inlet from Clinic”.

Connect the primary cooling system hoses within the base of the Heat Exchanger cabinet as follows:

1. For the water hoses that interconnect the Water to Water Heat Exchanger to the chilled water system of the medical facility, route the supply and return lines into the base of the Heat Exchanger cabinet. Position the water hoses so the factory–installed connectors on the hoses are connected inside the base of the Heat Exchanger cabinet.
2. Connect the blue–banded water hose (water supply hose) to the left-most Heat Exchanger water connection labeled “Inlet from Clinic”. Tighten the connection with the 36mm and 41mm open–end wrenches to approximately 25 ft–lbs.
3. Connect the red–banded water hose (water return hose) to the Heat Exchanger water connection labeled “Water Outlet”. Tighten the connection with the 36mm and 41mm open–end wrenches to approximately 25 ft–lbs.
4. Connect the primary water hoses to the medical facility’s chilled water system. Observe the direction of water flow to ensure that the supply and return primary water hoses are properly connected.

Connecting the Air Hoses (Water-Air Heat Exchanger Only)

Two air hoses are supplied with the system. Connect them to the external wall as described below and as shown in *Figure 6-5* and *Figure 6-6*:

- To enable installation of the air hoses and maintenance of the cooling system, leave at least one meter between the water cooling system (WCS) and the wall.
- Leave at least one meter between the air intake and the exhaust hoses on the wall.

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- Use a removable connection for the air inlet hose, to allow maintenance in the cabinet.
- Ensure that the minimum bending radius for air hoses is one meter.

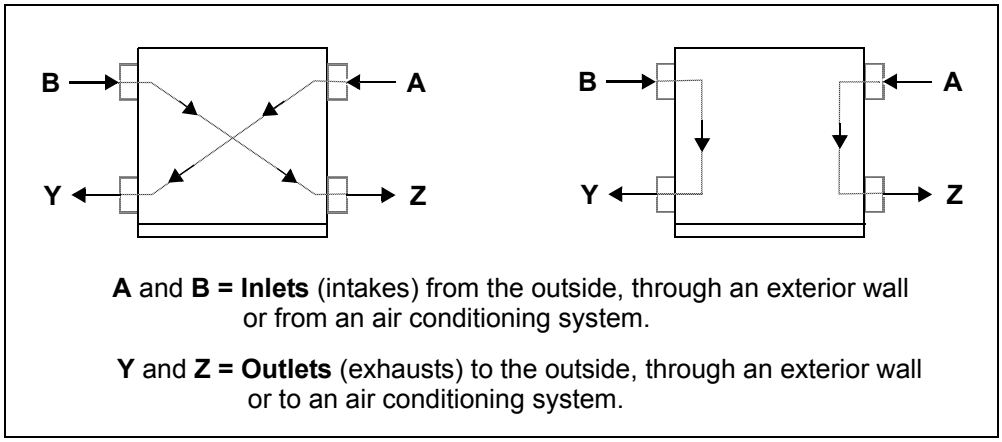
B
A
Y
Z
B
A
Y
Z
A and **B = Inlets** (intakes) from the outside, through an exterior wall or from an air conditioning system.
Y and **Z = Outlets** (exhausts) to the outside, through an exterior wall or to an air conditioning system.

Figure 6-5: Possible Connection Combinations for Air Hoses

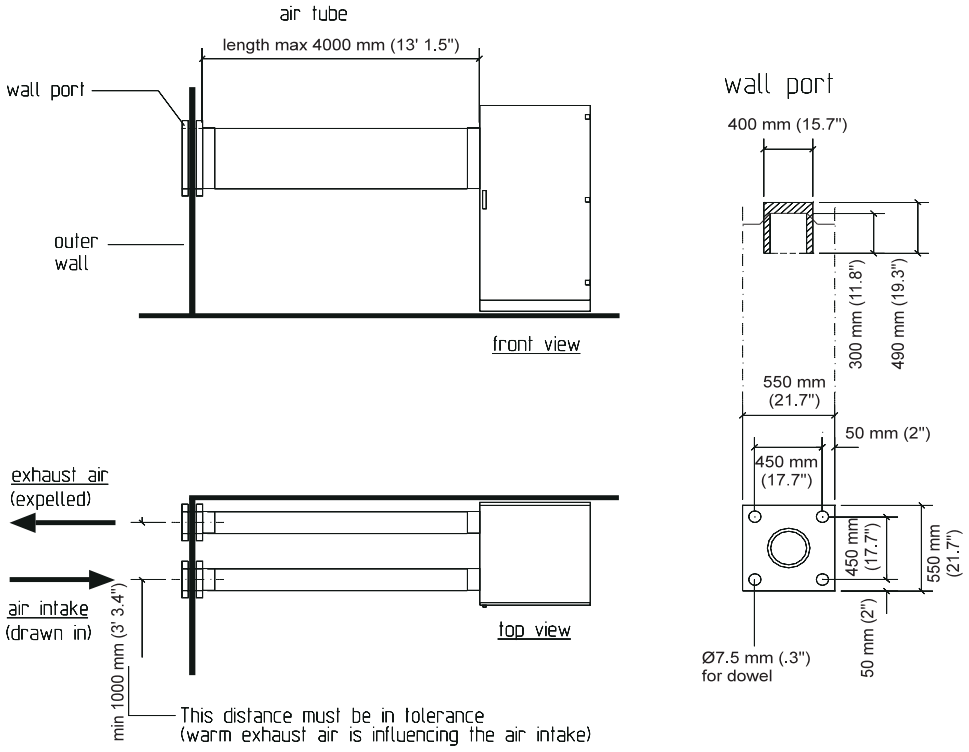

Figure 6-6: Routing for Air Hoses

Filling the Water System

The following two sections describe how to fill the water system for a Water-Water Heat Exchanger and for a Water-Air Heat Exchanger, in that order.

NOTE

When refilling the cooling system, flush out the circuit for approximately 15 minutes before you close the filling valve to build up the pressure. This helps remove metal particles and other residue from the cooling system.

CAUTION

Filling or refilling of the Gantry water circuit must be performed with the WCS switched OFF.
Do not operate the water pump of the WCS system before the Gantry water circuit (Gantry -WCS loop) is filled.
Even short-term operation without water will destroy the water pump.

CAUTION

If the water flow is too great in the Gantry (noise in the water pipeline is audible), reduce the flow in the valve by closing it approximately 15–30 degrees.

Water-Water Heat Exchanger

Throughout the filling process, check continuously for water leaks.

NOTE

If you are refilling a Heat Exchanger that was already filled once, before you begin, make sure the power is not connected to the Heat Exchanger.

To fill the water system of the Water-Water Heat Exchanger (*Figure 6-9*), do the following:

1. Connect the pressure gauge that is supplied with the system above the stop valve (shown in *Figure 6-9*).
2. To open the three-way valve in the right leg of the Gantry, turn it clockwise (CW) as far as it goes, using a 5 mm Allen key. See *Figure 6-7*.

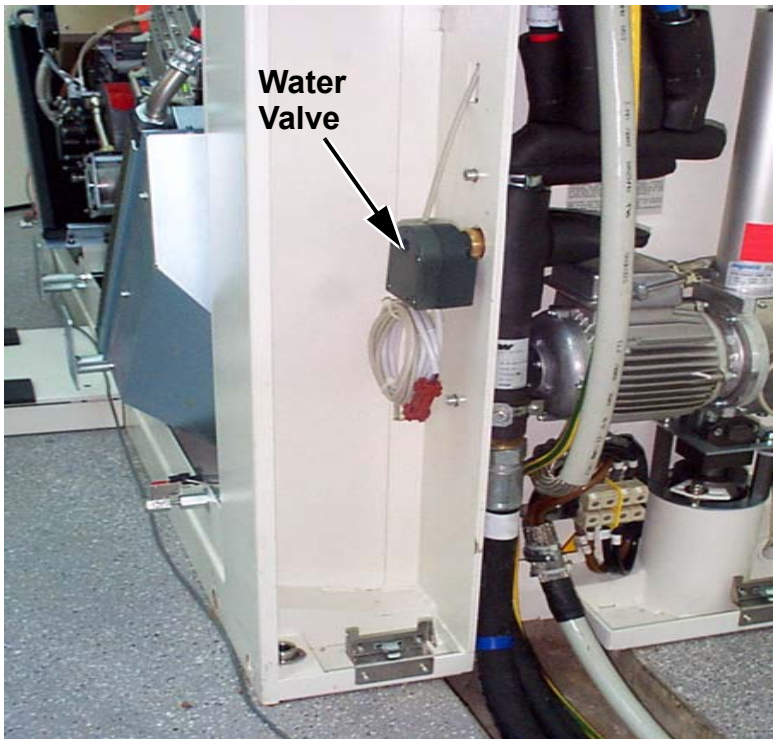

Figure 6-7: Valve in the Right Leg of the Gantry

3. Connect one flexible 1/2" water hose to the fill valve (below the stop valve) and to a water supply, using the adaptor supplied with the Heat Exchanger and the 1/2" tube clamp. See *Figure 6-9*.
4. Connect the second flexible 1/2" water hose to the drain valve and to drainage. See *Figure 6-9*.
5. Open the three-way valve in the Heat Exchanger (shown in *Figure 6-8*) by turning it clockwise (CW), using a 5 mm Allen key.

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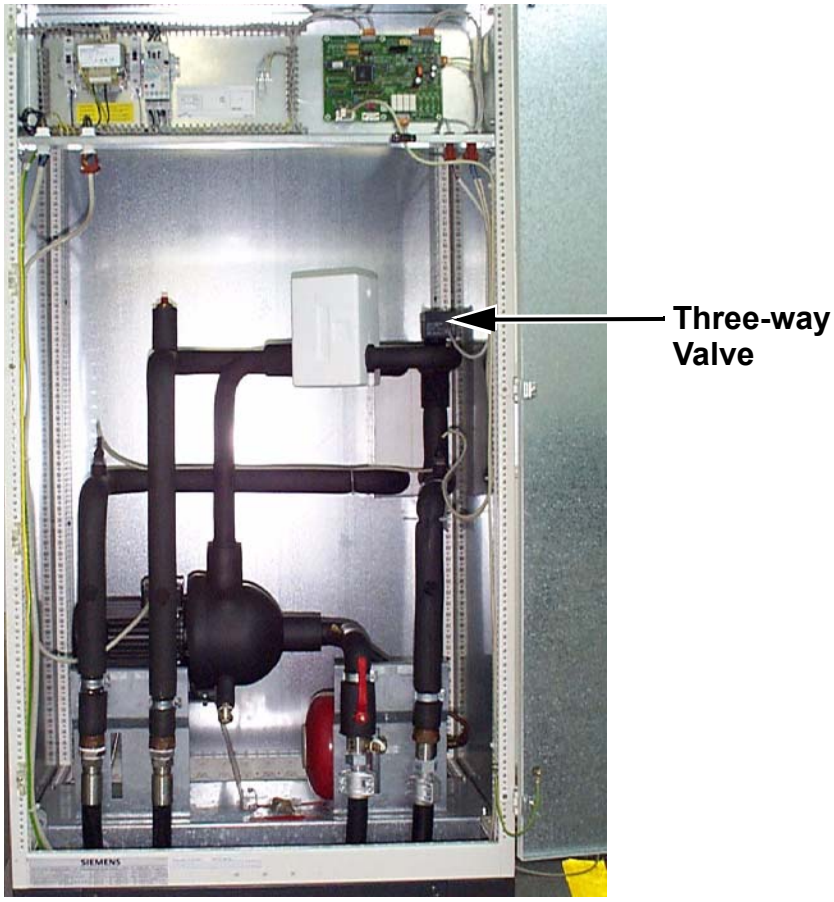

Figure 6-8: Three-way Valve in the Heat Exchanger

6. Make sure that the stop valve is closed (in a horizontal position). See *Figure 6-9*.
7. Open the fill and drain valves (they are open when the lever is vertical), using a 5 mm open wrench. See *Figure 6-9*.
8. Open the hospital's water tap to flush the system for 15 minutes.
9. Watch the drainage hose and check that no more air bubbles come out of the water hose.
10. Close (turn to a horizontal position) the drain valve (close to the water pump).
11. Watch the pressure gauge until it indicates 2 bar±0.2 bar.
12. Close the fill valve (below the stop valve).
13. Open the stop valve.
14. Make sure that the pressure still indicates 2 bar ± 0.2 bar. You can control it by opening the drain valve or the fill valve.
15. Close the water supply.

After the system has been working for a few days, do the following checks:

- Check the pressure gauge again. The working pressure should be 1.3 bar ± 0.2 bar. It might be necessary to fill the system again. If it is, recheck the pressure again, after a few days.
- Check for water leaks.

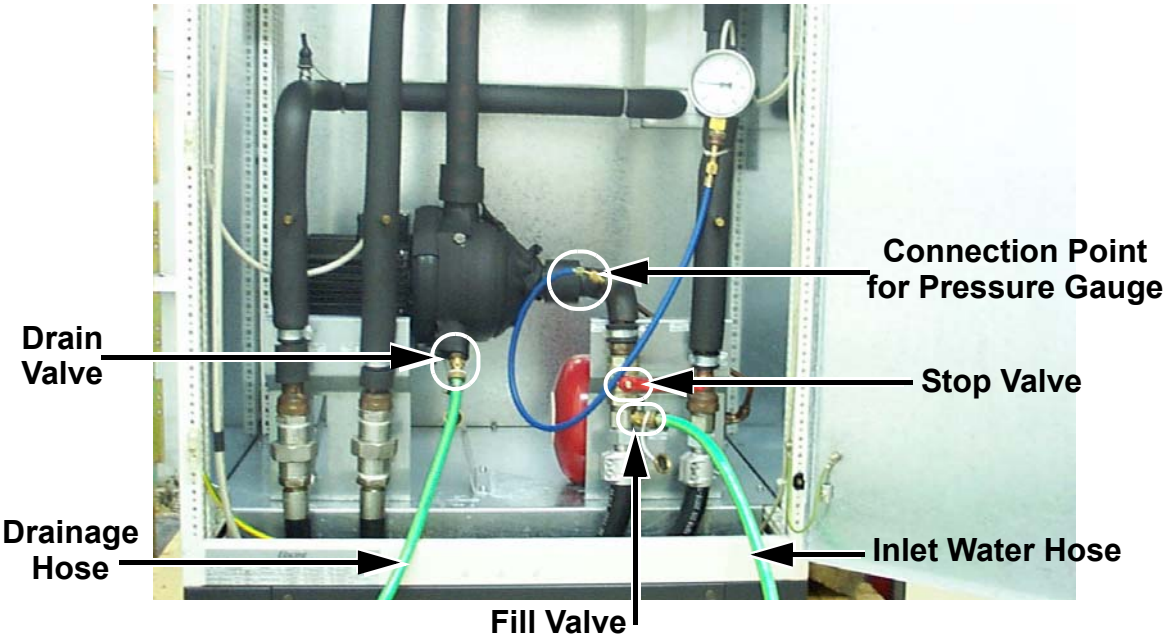

Figure 6-9: Filling the Water System of the Water-water Heat Exchanger

Water-Air Heat Exchanger

To fill the water system of the water-air Heat Exchanger (*Figure 6-10*), do the following:

1. Connect the pressure gauge that is supplied with the system above the stop valve (shown in *Figure 6-9*).
2. To open the three-way valve in the right leg of the Gantry, turn it clockwise (CW) as far as it goes, using a 5 mm Allen key. See *Figure 6-7*.
3. Connect one flexible 1/2" water hose to the fill valve (below the stop valve) and to a water supply, using the adaptor supplied with the Heat Exchanger and the 1/2" tube clamp. See *Figure 6-10*.
4. Connect the second flexible 1/2" water hose to the drain valve and to drainage. See *Figure 6-10*.
5. Make sure that the stop valve is closed (in a horizontal position). See *Figure 6-10*.
6. Open the fill and drain valves (they are open when the lever is vertical), using a 5 mm open wrench. See *Figure 6-10*.
7. Open the hospital's water tap to flush the system for 15 minutes.
8. Watch the drainage hose and check that no more air bubbles come out of the water hose.
9. Close (turn to a horizontal position) the drain valve (close to the water pump).
10. Watch the pressure gauge until it indicates 2 bar±0.2 bar.
11. Close the fill valve (below the stop valve).
12. Open the stop valve.
13. Make sure that the pressure still indicates 2 bar ± 0.2 bar. You can control it by opening the drain valve or the fill valve.
14. Close the water supply.

After the system has been working for a few days, do the following checks:

- Check the pressure gauge again. The working pressure should be 1.3 bar ± 0.2 bar. It might be necessary to fill the system again. If it is, recheck the pressure again, after a few days.
- Check for water leaks.

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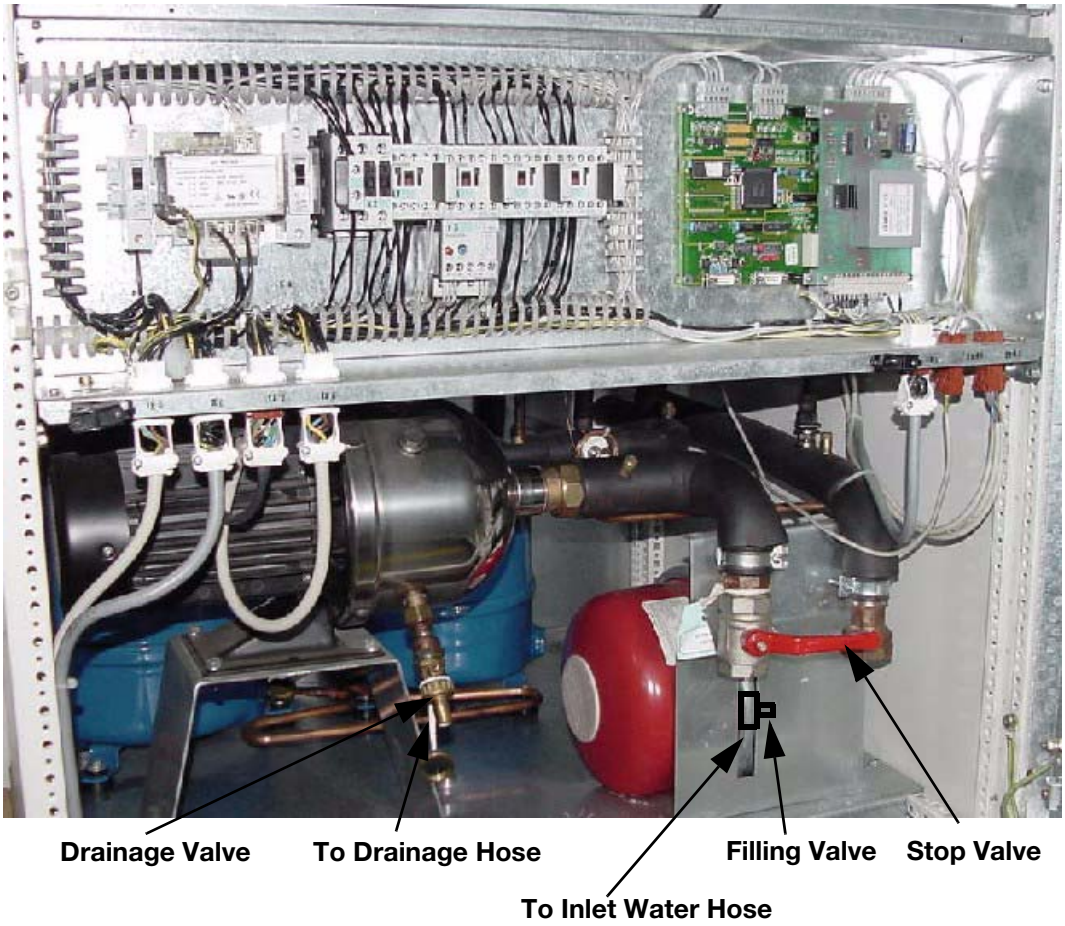


Figure 6-10: Water-air Heat Exchanger

Electrical Connections

This section describes how to route the electrical cables, and then how to connect them to each component of the system.

Routing the Cables

This section contains layout diagrams and tables that define routing of mains and protective conductors, and system cables.

Use *Figure 6-11* as a key to understanding the layout diagrams (*Figure 6-12* and *Figure 6-13*).

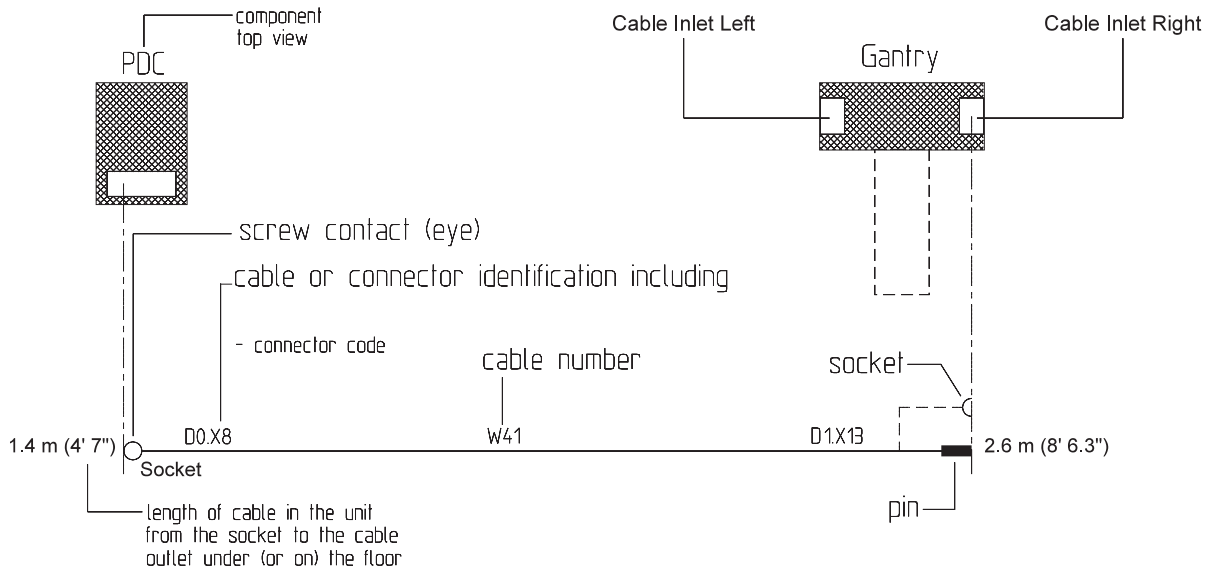


Figure 6-11: Key to System Cable Layout Diagrams

NOTE

- The Mx8000 comes with a fiber optic cable. When routing the fiber optic cable, be very careful not to damage it.
- The bending radius for the fibre optic cable must not be less than 30 mm (1").
- Separate the mains and protective conductors from the signal cables.
- Route cables so that they do not become entangled.
- Place the extra length of cables near the Power Distribution Cabinet (PDC).
- Do not connect the cables to the system components yet. Wait until you are specifically instructed to do so (in later sections).

Route all cables as indicated in *Table 6-1* and shown in *Figure 6-12* and *Figure 6-13*.

Table 6-1. Mains and Protective Conductor Connections

Cable No.	Type of Cable or Function	From	To	Comments
W1	Mains cable	PDC	Gantry Left Leg	
W2	Protective conductor	PDC	Gantry Right Leg	
W3	UDC Power cable	PDC	Gantry Right Leg	Shielded cable, for the generator
W4	Mains cable	PDC	Heat Exchanger	
W5	Protective conductor	PDC	Heat Exchanger	Route parallel with W4.
W6	Patient table power	Gantry Left Leg	Patient Table	Already routed in Gantry channel.
W7	Patient Table PE	Gantry Left Leg	Patient Table	Already routed in Gantry channel.
W11	Protective conductor	PDC	Computer Rack	
W50	Gantry control cable	Gantry Left Leg	Computer Rack	50 Pin D-Sub connector
W51	MCU control cable	Gantry Left Leg	PDC	9 Pin D-Sub connector
W52	Patient Table control cable	Gantry Left Leg	Patient Table	Already routed in Gantry channel.
W53	WCS control cable	Gantry Left Leg	Heat Exchanger	9 Pin D-Sub connector
W54	PDC control cable	PDC	Computer Rack	15 Pin D-Sub connector
W55	Data cable	Gantry Left Leg	Computer Rack	Fiber optic cable
W865	Harness between Rack and Console	Console	Computer Rack	Permanently connected on console side.
W880	Control cable	Gantry Left Leg	Computer Rack	GPC
W881	Mains computer cable	PDC	Computer Rack	
W882	Line voltage cable	PDC	Local Power Supply	Shorten to needed length.
W883	Additional protective ground	PDC	Local Power Distribution Panel	Local ground connected to the building ground bar.
1	Mains cable	PDC	Radiation ON Indicator	On-site cable for connecting the non-referenced relay switch contact (250V / 5A ~ AC)
2	Control cable	PDC	Door Switch	On-site cable

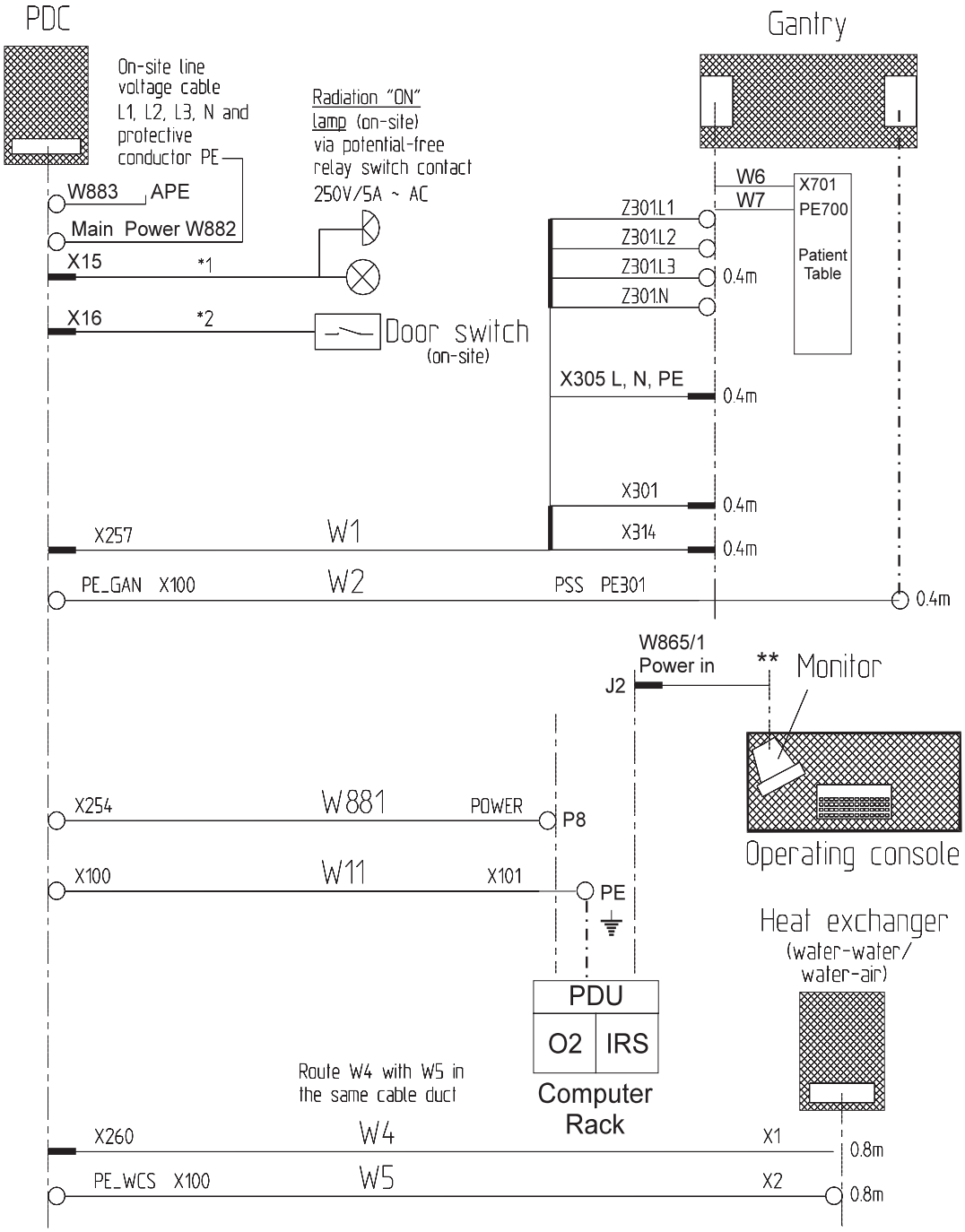
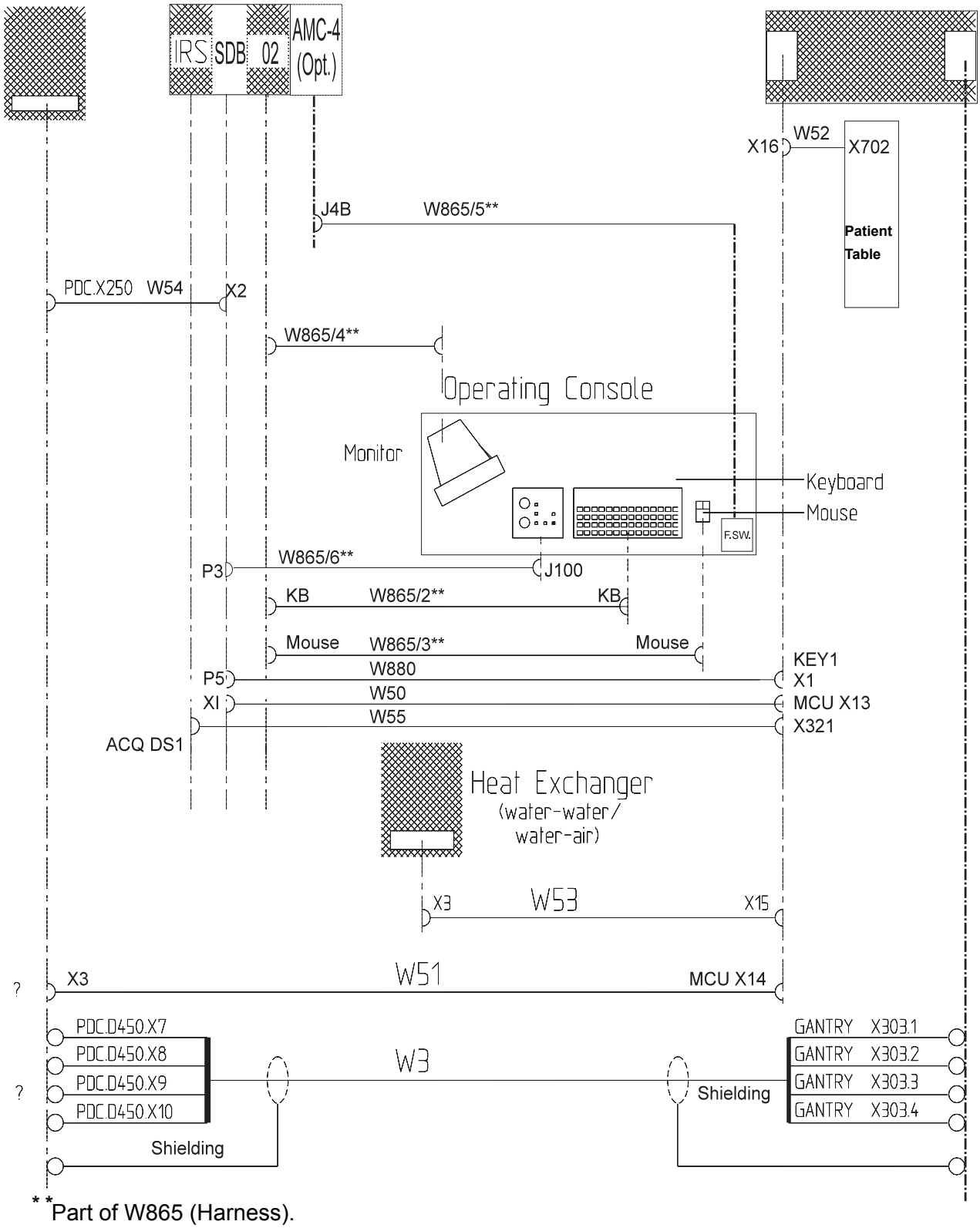


Figure 6-12: Mains and Protective Conductor Connections

** Part of W865 (Harness)



** Part of W865 (Harness).

Figure 6-13: System Connections

Connecting the PDC

The following cables are routed to the Power Distribution Cabinet (PDC):

- W882 main power supply
- W883 Additional Protective Earth (APE)
- W1 power to the left leg of the Gantry
- W2 protective conductor to the Gantry
- W881 power to the computer rack
- W11 protective conductor to the computer rack
- W4 power to the Heat Exchanger
- W5 protective conductor for the Heat Exchanger
- W54 signal cable
- W51 signal cable
- W3 high voltage supply cable to the right leg of the Gantry
- Cable to Radiation ON lamp
- Cable to Door Switch

NOTE

- To permit the passing of cables from the PDC base to the interior of the PDC, open the cable clamp section of the sheet metal cover enclosing the PDC base. Loosen the two torx screws and slide the movable section to the rear of the PDC.

- With the PDC base side covers having been removed for access, route all cables into the base, through the cable clamp and into the interior of the PDC.

- Auxiliary cable clamps at the bottom of the PDC are for securing the W3 and W882 cables. The auxiliary clamp located on the left side of the PDC is used to secure the high voltage DC supply cable (W3) to the Direct Current Controller.

- Connect all cables according to the information listed in the appropriate tables and figures.

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Connect the PDC as follows:

1. Open the front door of the PDC.
2. Loosen the two screws on the cover in the base of the PDC, and slide the cover back.
3. Remove one of the lower side covers and route all the cables under the PDC and through the opening.
4. Make sure that cable W3 is routed via the left cable clamp at the bottom of the PDC.
5. Connect all the cables according to the information listed in the appropriate table and figure, as follows:
   a. Connect all protective conductors (W883, W2, and W511) to the X100 PE connection points located in the lower left side of the PDC as shown in *Figure 6-14*.
   b. Verify that all the protective conductors are properly connected.
   c. Connect all main supplies as specified in *Table 6-2* and shown in *Figure 6-14*

Table 6-2. Connection Points for Main Supplies

Cable	Connection Point
W1	X 257
W881	X254
W4	X 260

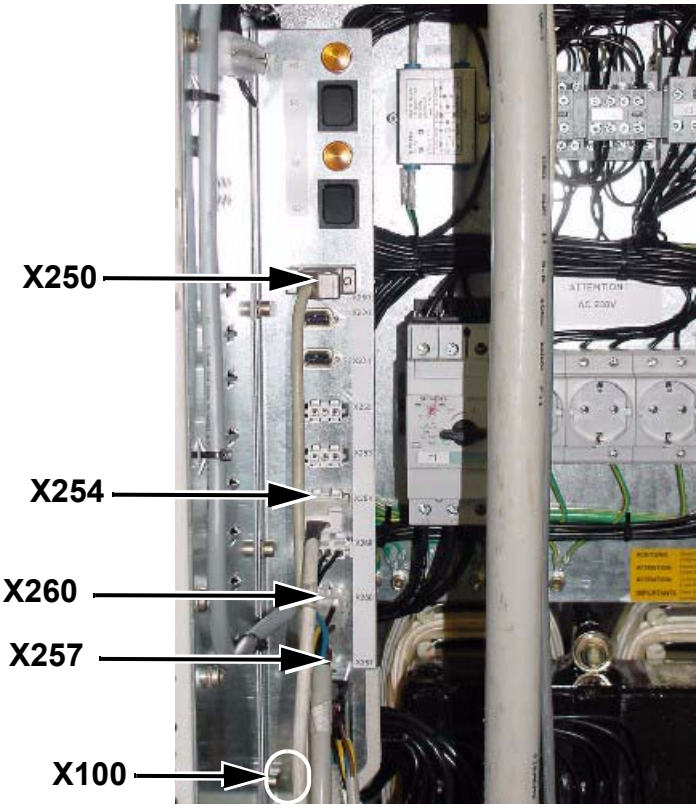

Figure 6-14: Main Supply Cable Connection Points in the PDC

d. Connect all signal cables as specified in *Table 6-3* and shown in *Figure 6-15*. Remove transparent plastic protection in the upper part of the PDC to enable access to the cables.

Table 6-3. Signal Cable Connection Points

Cable	Connection Point	Remarks
W54	X250	See *Figure 6-14*.
W51	Board D451* Connector X3	
Radiation on Lamp	Board D451* Terminal X15	
Door switch	Board D451* Terminal X16	If the door switch is not used at your site, use a short jumper to shorten the X16 terminal in card D451.
W3	Generator Board, X7 through X10	Make sure that the shielding makes good contact with the cable clamp. See *Figure 6-15*.

* *The D451 board is located in the upper part of the PDC near the Direct Current Controller (DCC) as shown in Figure 6-15.*

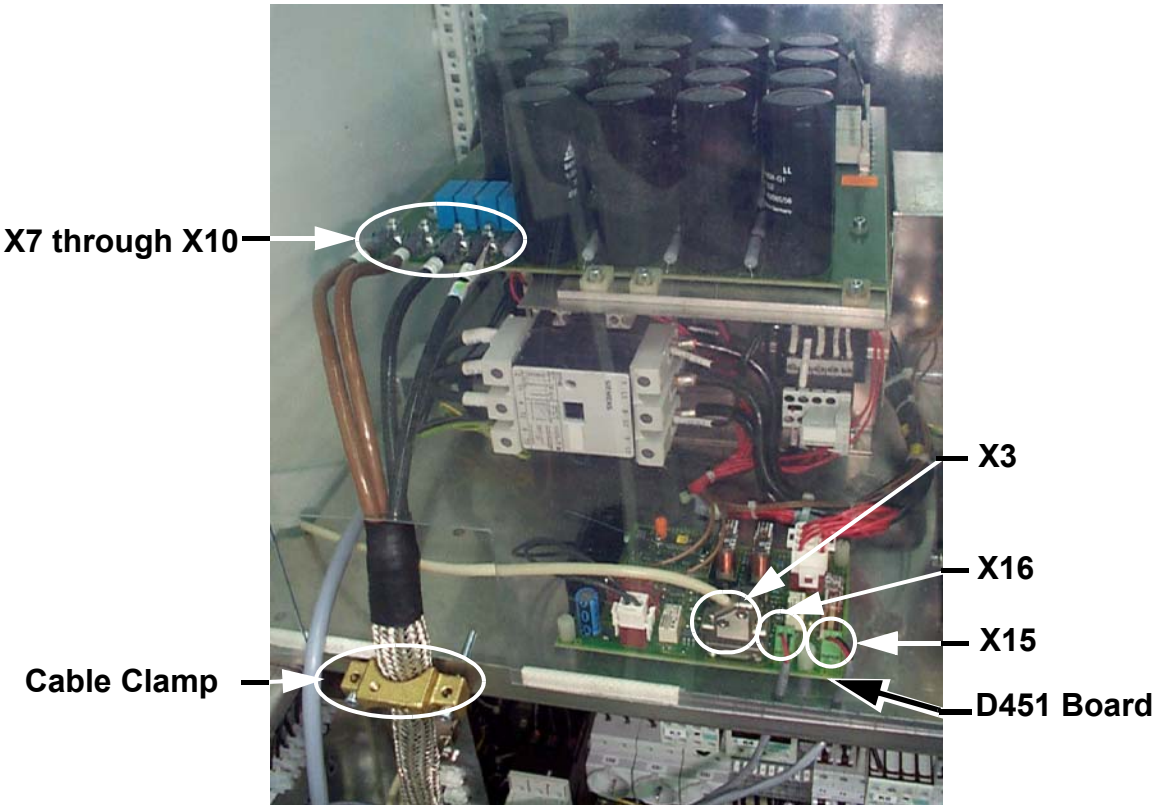

Figure 6-15: Signal Cables Connection Points

e. Route the Main Power supply cable W882 into the PDC (under F200), via the right cable clamp.

f. Connect the three phases of the main power supply cable to the PDC connection points that are under F200, using a 6 mm Allen key. (Remove the plastic cap to expose the screw.) See *Figure 6-16*.

g. Connect the neutral and PE to the terminals on the left side of F200, using a flat screwdriver. See *Figure 6-16*.

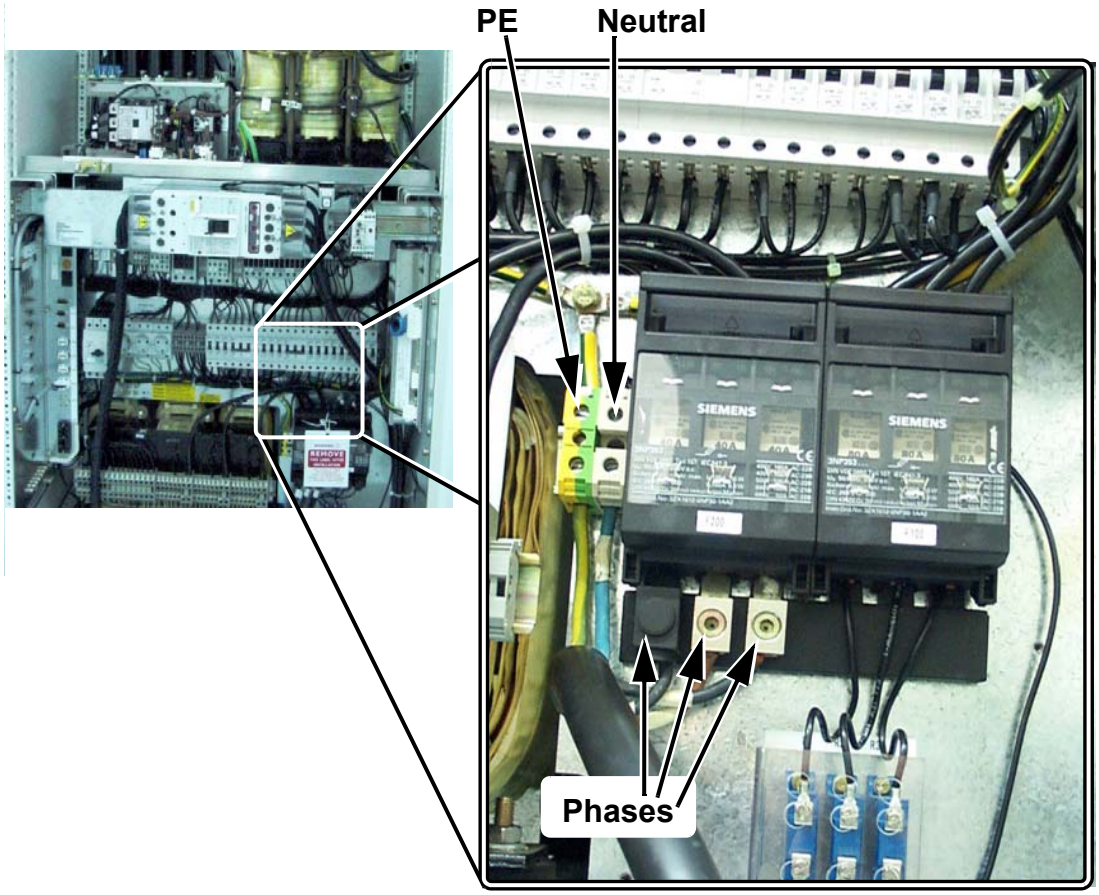

Figure 6-16: Main Power Supply Connections

6. Use cable ties to secure all cables in place.
7. All remaining cables can be left under the PDC or behind it. Do not leave the cables disordered. Use cable ties to arrange them neatly.
8. Connect the PE cable (W883) to the PE in the local power distribution board.
9. If your site has a receptacle and plug for the main supply, connect the main power supply cable (W882) to the receptacle plug.

CAUTION

DO NOT connect the PDC to the power supply as yet!

Connecting the Gantry

All connectors that are routed to the left leg of the Gantry are labelled with the destination.

Cables are routed to each leg of the Gantry from below.

Left and right references are from the point of view of a person standing at the open end of the Patient Table, facing the Gantry. See *Figure 6-17*.

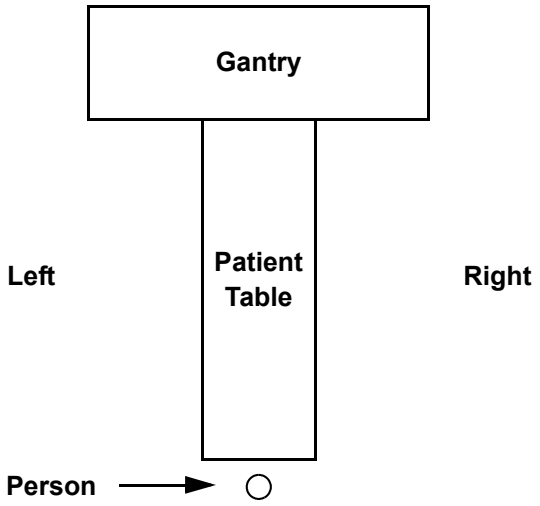

Figure 6-17: Left and Right References

Connections to the Left Leg of the Gantry

The following cables are routed to the left leg of the Gantry:

- W1 (harness) mains
- W880 control cable
- W50 control cable
- W55 optic fiber data cable

CAUTION

Data cable W55 requires careful handling. Its minimum bend radius must not exceed 30mm (1.18”).

- W53 control cable
- W51 control cable

Route the cables into the left leg of the Gantry, from below, as shown in *Figure 6-18* and described below:

1. Connect the cables (mains first) according to the following order:
   a. Connect the cables labelled Z301 (L1, L2, L3, N) that extend from the W1 harness on the Center Vertical Bracket, indicated in *Figure 6-18*. Use a 10 mm Hex wrench or an open wrench.
   b. Connect the X314, X305 and X301 connectors that extend from the W1

harness on the Vertical Connector Bracket, indicated at the right in *Figure 6-18*.

c. Connect the W55 fiber optic cable on the lower part of the Horizontal Bracket indicated in the upper right corner of *Figure 6-18*.

NOTE

Fiber optic cable W55 may be colored bright orange, blue or another solid color and is not labeled.

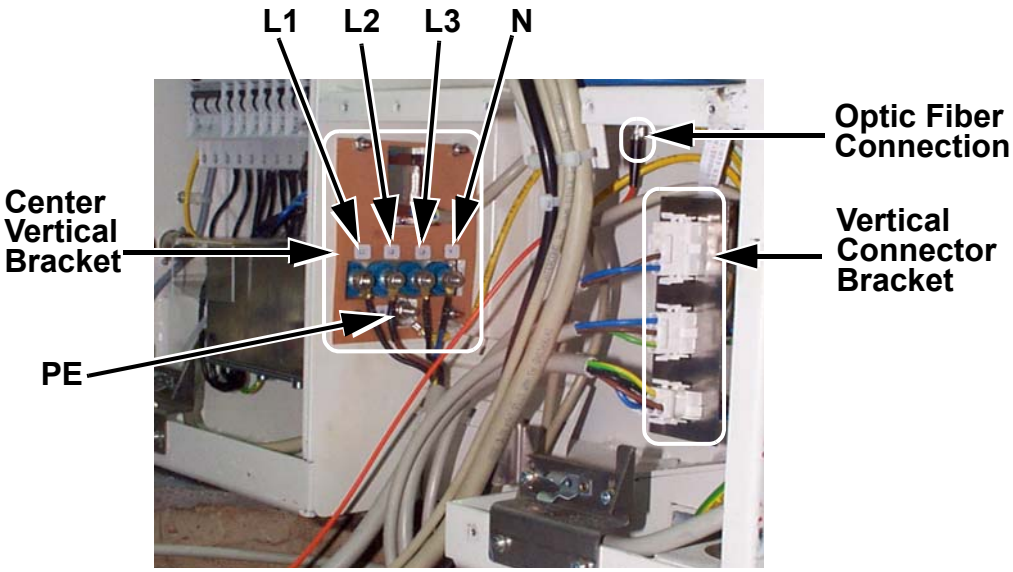

Figure 6-18: W1 and W55 Connections

d. Remove the cover of the MCU by releasing the four screws and pulling the cover.

e. Connect the following cables to the MCU Card: W50 to X13, W51 to X14, W53 to X15, (see *Figure 6-19*).

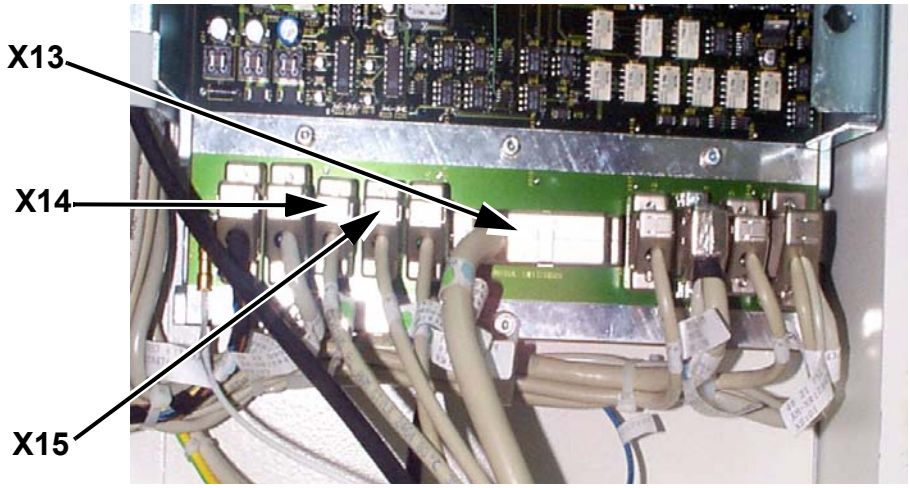

Figure 6-19: MCU Card Connections

f. Route cable W880 upwards, along the left side of the Master Control Unit (MCU) board and along the cables, up to the connector, as shown in *Figure 6-20*. (The route of the cable is emphasized in white.)

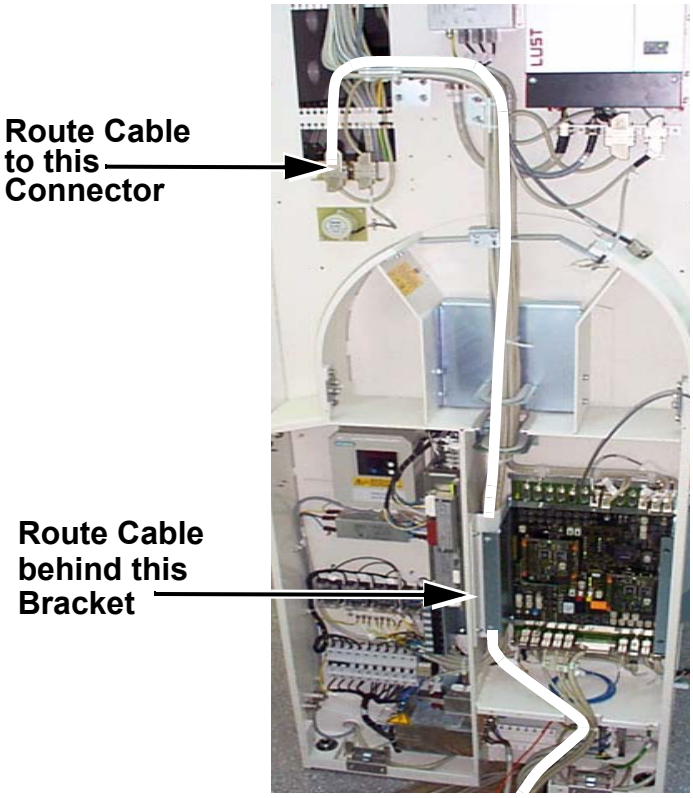

Figure 6-20: W880 Cable Routing

2. Secure each cable in place, using cable ties.

Connections to the Right Leg of the Gantry

The following cables are routed to the right leg of the Gantry:

- W3 - High Voltage cable (shielded)
- W2 - protective ground

NOTE

The excess length of the W3 cable at the Gantry end (not including the cable required for the connection in the PDC and for correct routing) may not exceed two meters. If it does, shorten it as described in the next section. Then continue to connect it as described in this section.

Route the cables into the right leg of the Gantry as shown in *Figure 6-21*, and as described below:

1. Connect W2, protective ground, to ground screw PE 301, labelled "Step 1" in *Figure 6-21*.
2. Connect W3 to connection strip X303 starting from 1 to 4, labelled "Step 2" in *Figure 6-21*.
3. Ensure that the shield has good electrical connection with the metal bracket using a clamp, labelled "3" in *Figure 6-21*.

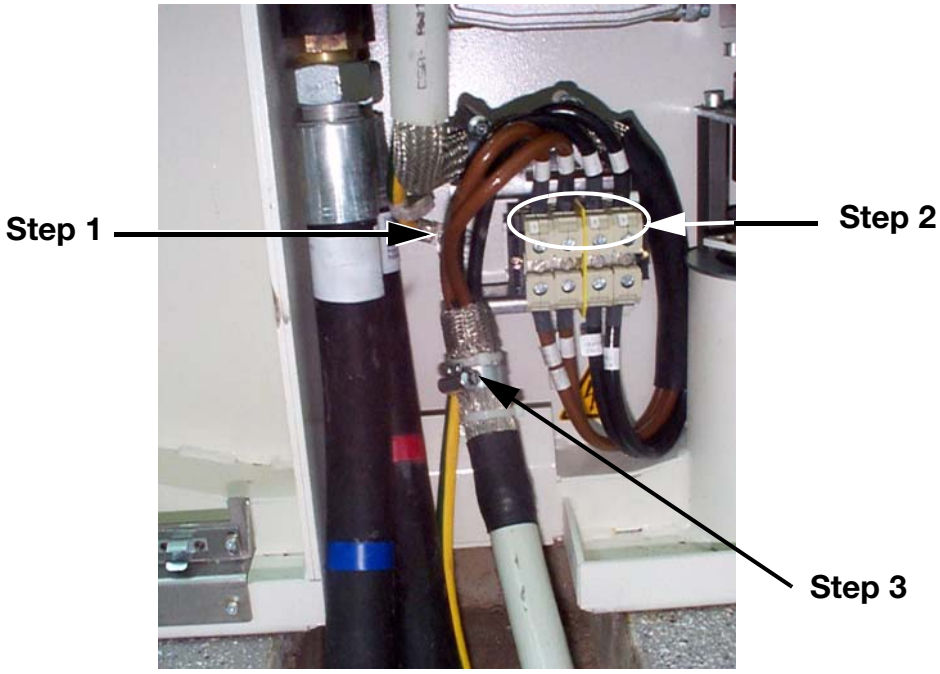

Figure 6-21: Connections to the Right Leg of the Gantry

Shortening the W3 Cable

There may not be more than two meters of excess W3 cable at the entry point to the Gantry, i.e., after it has been connected in the PDC and routed to the Gantry.

Before shortening the cable make sure it is correctly connected in the PDC and routed to the Gantry. Then, if there is more than two meters left, shorten it at the Gantry end as described in this section.

You must supply the following:

- a hacksaw (for sawing through metal)
- a cutter
- a crimper (WAGO number 206-216 or the equivalent)
- a cable stripping knife
- a hot air blower

In addition, you need the following, which are supplied with each system:

- tubes of shrinking insulation
- ferrules

Shorten the cable as follows:

1. Measure the excess cable, and mark it at the desired length.
2. Cut the cable using the hacksaw.
3. Remove 35 cm of the gray outer insulation of the cable.
4. Remove 27 cm of the shielding of the cable and of the transparent wrap that covers the four wires in the cable. Cut the four fine wires that reinforce the cable.
5. Slide a tube of shrinking insulation onto the cable so that it covers two to three centimeters of the shielding, and shrink with the hot air blower.
6. Strip only 18 millimeters (not centimeters, as in earlier steps) at the ends of each of the four wires in the cable.
7. Twist the fine copper wire strands to compact the conductor and insert each of the four compacted wire strands into a separate ferrule.
8. Crimp the ferrule of each conductor with the crimper set to 16 mm^2.
9. Mark the new cable with the supplied labels. The two brown wires are X303-1 and X303-2, and the two black wires are X303-3, and X303-4.

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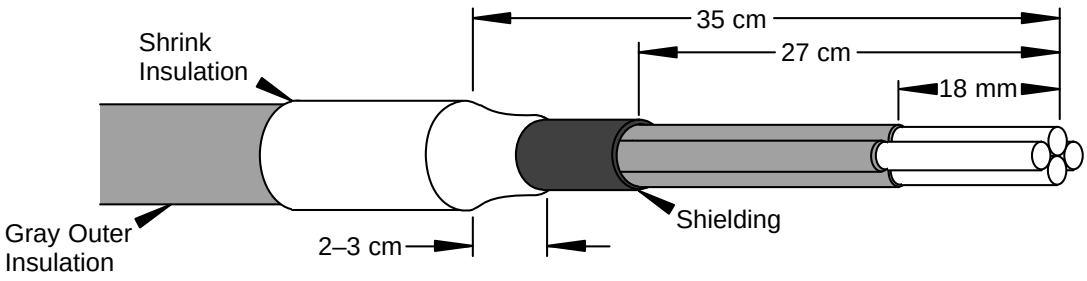

Figure 6-22:

Connect Cables W2 and W3

1. Connect W2 (protective earth) to ground screw PE 301, labeled in *Figure 6-21*.
2. Connect W3 to connection strip X303 starting from 1 to 4, labeled in *Figure 6-21*.
3. Ensure that the shield has good electrical connection with the metal bracket using a clamp, labelled in *Figure 6-21*.

Connecting the Patient Table

Leave the Connecting Piece open until all electrical work has been completed.

Route the X701, X702, X703, X704 and PE700 cables that come from the Gantry into the Connecting Piece that is between the Patient Table and the Gantry, as described below:

1. Route the five connectors (X702, X703, X704, E703 and X709) and the Protective Earth (PE) cable from the Patient Table through the hole in the base of the Patient Table into the Connecting Piece.
2. Connect the two X702 connectors (one from the Gantry and one from the Patient Table) to each other in the Connecting Piece.

   Do the same for the two X703 connectors and for the two X704 connectors.
3. Route the X701 mains cable into the base of the Patient Table to connection point X701, as shown in *Figure 6-23*.
4. Route the PE700 cable into the Patient Table and connect it to point PE700, using a 5 mm Allen key. See *Figure 6-23*.
5. Connect the PE cable that comes from the Patient Table in the Connecting Piece to point PE706, using a 10 mm socket.

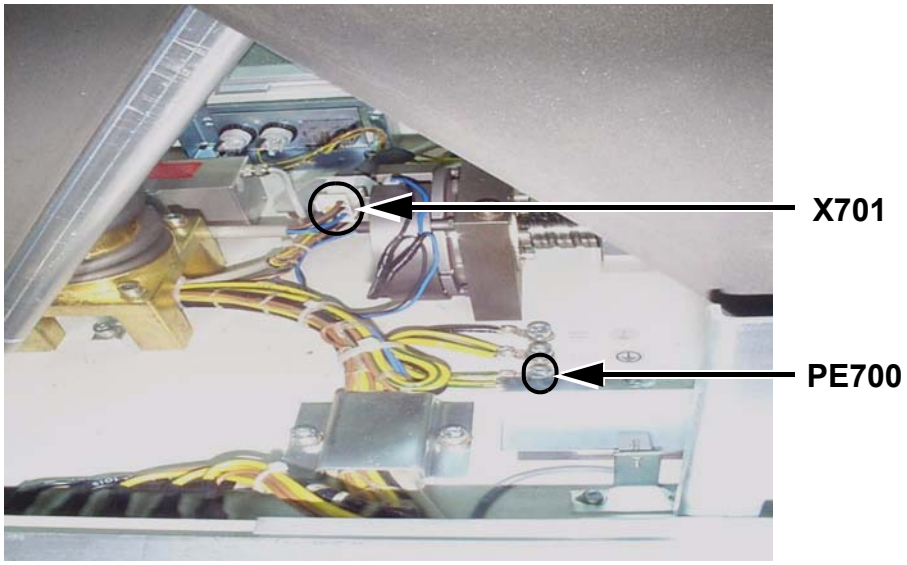

Figure 6-23: Connections in the Patient Table Base

6. Connect both E703 connectors to each other in the Connecting Piece.

NOTE

The X709 cable is not connected. It is reserved for future options

Connecting the Heat Exchangers (Water-Water and Water-Air)

The following cables are routed to the Heat Exchanger:

- W4 mains
- W5 protective ground
- W53 control cable

Water-Water Heat Exchanger

Do the following to connect the water-water Heat Exchanger:

1. Route the W4 and W5 cables under the Heat Exchanger, along its left side to the upper part, and connect them as follows:
   a. Connect W4 to the connector at the extreme left as shown in *Figure 6-24*.
   b. Connect W5 to the ground screw behind the left connector as shown in *Figure 6-24*.

2. Route the W53 cable under the Heat Exchanger, along its right side, to the upper part. Connect the connector to X3 on the control board as shown in *Figure 6-24*.
3. Use cable ties to secure the cables in place.

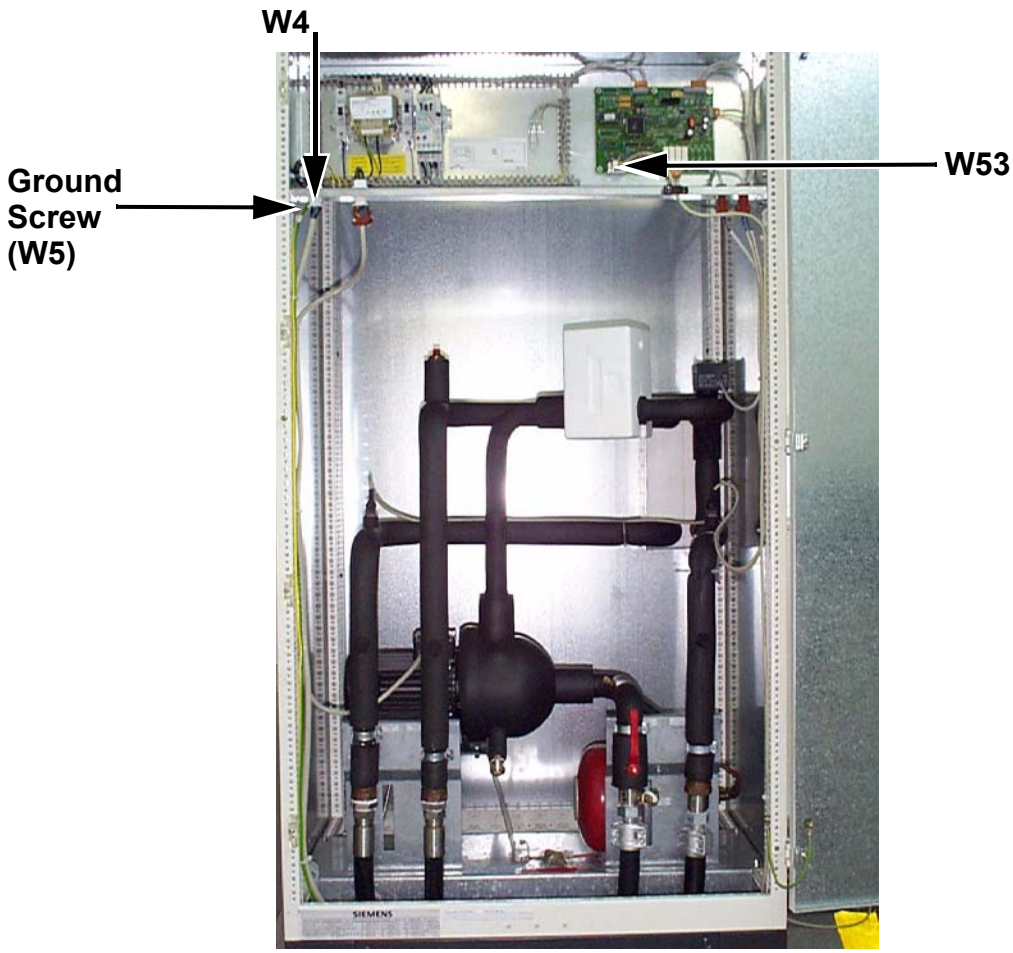

Figure 6-24: Cable Routing for Water-water Heat Exchanger

Water-Air Heat Exchanger

Connect the Water-air Heat Exchanger as follows:

1. Route the W4 and W5 cables under the Heat Exchanger, along its left side to the middle part and connect them as follow:
   a. Connect W4 to the connector X1.
   b. Connect W5 to the ground screw
2. Route the W53 cable under the Heat Exchanger, along its right side to the middle part and connect it to connctorX3 (MCU).
3. Use cables ties to secure the cables in place.

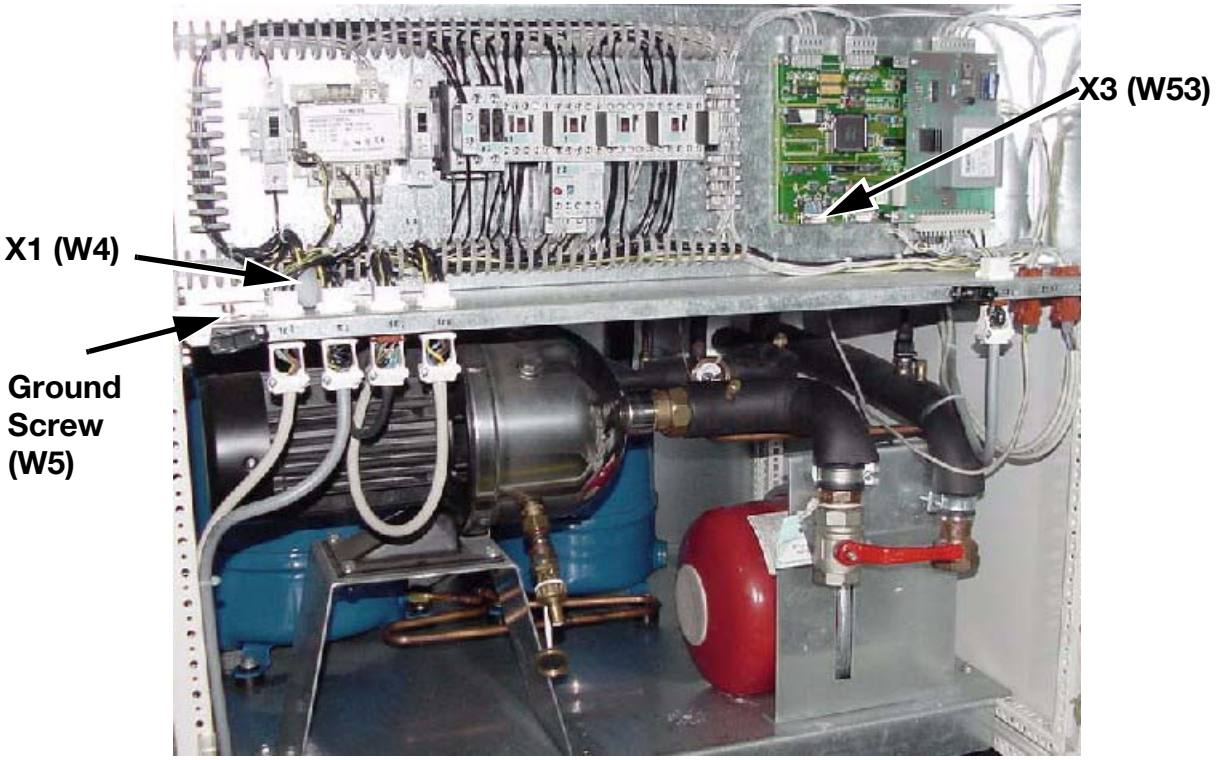

Figure 6-25: Cable Routing for Water-air Heat Exchanger

Connecting the Operating Station

The following cables are routed to the Computer Rack:

- W881 mains power to the Computer Rack
- W11 protective conductor
- W880 control cable
- W50 control cable
- W55 data cable
- W54 control cable
- W865 harness

Connecting the Operating Console to the Computer Rack

Connect the Operating Console to the Computer Rack as follows:

1. Open the rear and front covers of the Computer Rack.
2. Route the harness from the Operating Console to the rear of the Computer Rack.
3. Put the harness that comes from the Operating Console into the cable tie so that about 2-3 cm of the harness extends beyond the tie. See *Figure 6-26*. Do not tighten the cable tie yet.
4. Loosen the two screws and open the Signal Distribution Board (SDB) panel.
5. Connect the following cables:
   - 865/1 - Monitor power - to the right multi-outlet power supply
   - 865/6 - CT Box - to J3 on the SDB panel
   - 865/5 - Foot Switch - to AMC-4 unit, if any (The AMC-4 unit is optional.)

   The CT Box and the Foot Switch cables must be routed through the three cable ties beneath the SDB panel.

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Figure 6-26: Computer Rack - Rear View

6. Pass the keyboard, mouse and monitor cables extending from the harness toward the front of the Computer Rack, using two cable ties.
7. Close the SDB panel and tighten the two screws.
8. Unpack the O2 computer and place it in the Computer Rack from the front side. Position it in such a way that there is access to the rear panel of the computer.

9. Connect the following cables to the O2 computer:
   - PCI cable (do not use a screwdriver to tighten the connector)
   - Keyboard cable
   - Mouse cable
   - Monitor cable
   - Parallel port
   - SCSI cable
   - Serial ports (COM1 - CT box keys, COM2 - ACQ diagnostics)
   - AC power
10. Reposition the computer so that the front panel faces the front side of the Rack.
11. Gather all computer cables and secure them with cable ties.
12. Connect the audio cables to the lower line of connectors, on the side panel of the computer, red to red and black to white.
13. If the system has an EOD option, proceed as follows:
    a. Unpack the EOD drive and position it on top of the Computer Rack.
    b. Connect the SCSI cable and AC power to the EOD drive.
    c. Check that the termination is installed on the EOD drive.
14. Unpack the system monitor and position it on the Operating Console.
15. Connect monitor cable and AC power from the Console to the monitor.
16. Position the keyboard, mouse and the Scan Control Unit on the Operating Console.

Connecting the Computer Rack to the System

Connect the Computer Rack to the system as follows:

1. Connect the grounding cable W11 to the ground screw on the rear of the Computer Rack.
2. Route the following cables along the left side of the Rack using the cable ties and connect them to the SDB connectors:
   - W50 - to connector X1
   - W54 - to connector X2
   - W880 - to connector P5
3. Route the W55 fiber optic cable over the shelf, alongside the flat cables to the ACQ card (in the IRS unit), and secure it using cable ties.
4. Connect power cable W881 to P8 on the lower rear side of the Computer Rack.

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Installing the EOD Device (Optional)

If your system includes an EOD device, install it as follows:

1. Unpack the EOD device and place it on the Computer Rack
2. Take the power cable and the SCSI cable out of the back of the Computer Rack, and connect them to the EOD device.
3. Make sure the SCSI termination plug is connected to the EOD device and check that the EOD hardware address is verified as "3".
4. Turn the power switch ON.

Installing the AMC-4 Unit (Optional)

If your system includes the AMC-4 option, do the following to install it:

1. Unpack the AMC-4 unit and hang it on the two screws that extrude from the panel on the inside of the Computer Rack. *Figure 6-27* shows where to put the AMC-4 unit.

   Secure the unit in place using the small metal bracket just above the AMC-4 unit.

Figure 6-27: Location of AMC-4 Unit in Computer Rack

2. Connect the FTSW Out (foot switch out) cable to the AMC-4 unit.
3. Connect the AMC S Host cable to the AMC-4 unit.
4. Connect the AMC P Host cable to the AMC-4 unit.
5. Connect the Power cable to the AMC-4 unit.

6. From the cables supplied with the AMC-4 unit, select either the parallel communications cable or the serial communications cable, depending on your LMI.
7. Connect the communications cable to the AMC-4 unit. For serial communication, connect the it to AMC S LMI. For parallel communication, connect it to AMC P LMI. Connect the other end to the LMI.
8. Take out the part of the FTSW Out cable that is coiled inside the Operating Console.
9. Using the adapter that is appropriate for the type of LMI you have (from those supplied with the AMC-4 unit), connect the FTSW Out cable to the keypad of the LMI.
10. Switch the power switch of the AMC-4 unit to the 1 (ON) position.

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Chapter 7
Start-up Sequence

This chapter describes the following activities that are required to start up the system:

- Removing the Gantry Transport Locking Screws.
- Checking the rotor.
- Adapting line voltages.
- Adapting the system to the line frequency.
- Checking the protective conductors.
- Connecting to power and ground points.

Removing the Gantry Transport Locking Screws

WARNING

Verify that no electrical power is supplied to the system

WARNING

Open Gantry covers must be properly secured or removed from the immediate area. Failure to do so can result in serious injury to personnel.

WARNING

Metal tabs located at the top corners of the rear cover hook into brackets mounted at the top frame of the Gantry.

1. Remove the rear cover of the Gantry, as follows:
   a. Loosen the two screws that hold the cover in place.
   b. Pull the lower part of the cover about 10 cm away from the Gantry.
   c. Lift the cover upwards, until it is released from its notches.
   d. Set the cover aside in a safe position.
2. Loosen and remove the four rubber bumpers (the upper two are indicated in *Figure 7-1*) that support the Rotor, using a 17 mm open wrench to loosen each nut (see *Figure 7-1*) and then removing the bumper by hand.

WARNING

Pinch Hazard! Fingers can be caught in the close clearances between the rotating frame and the stationary frame.

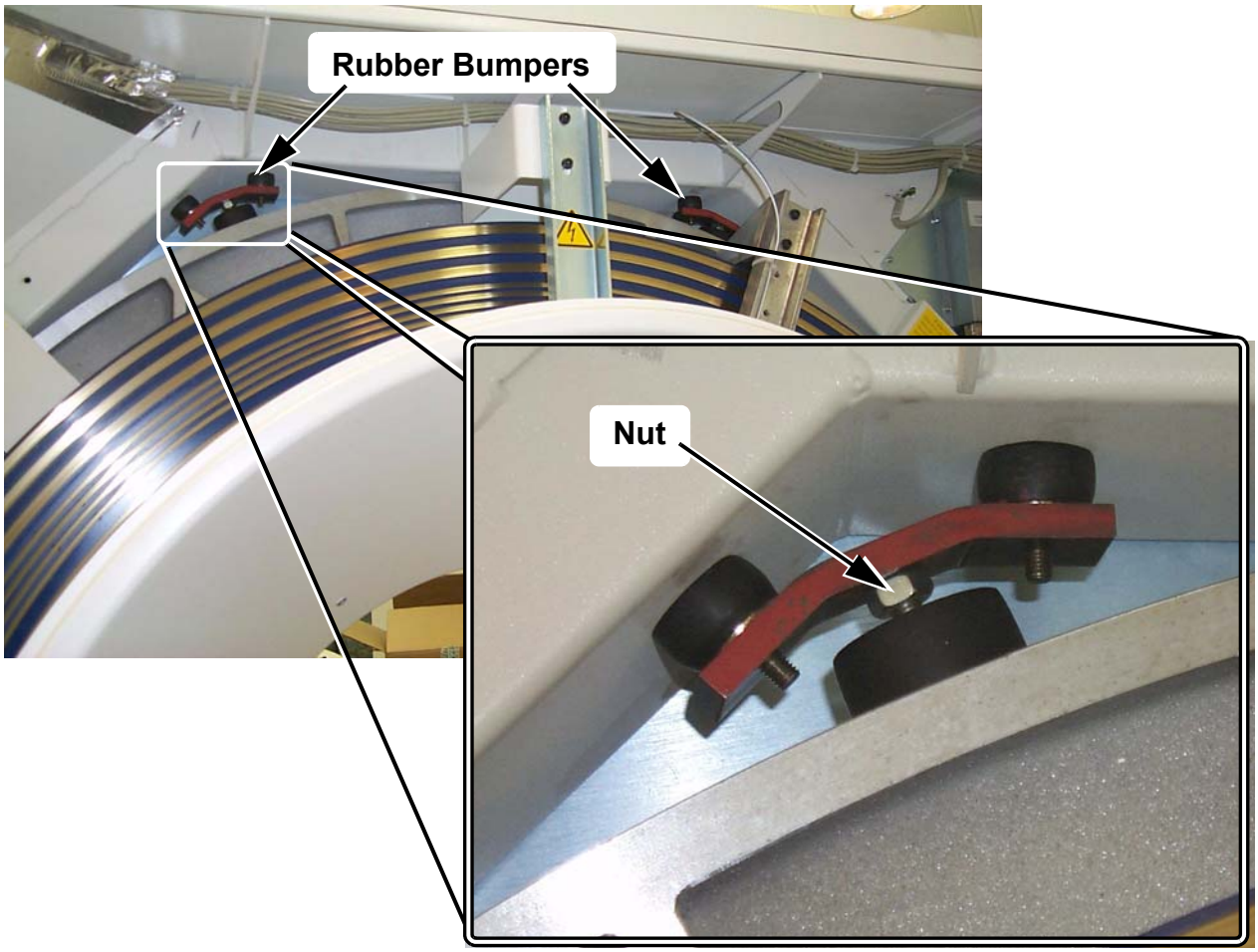

Figure 7-1: Rubber Bumpers (with enlargement of left bumper)

2. Loosen and remove the locking plate (shown in *Figure 7-2* at the 3 o'clock position when viewed from the rear), by opening the four screws with an 8 mm Allen socket.

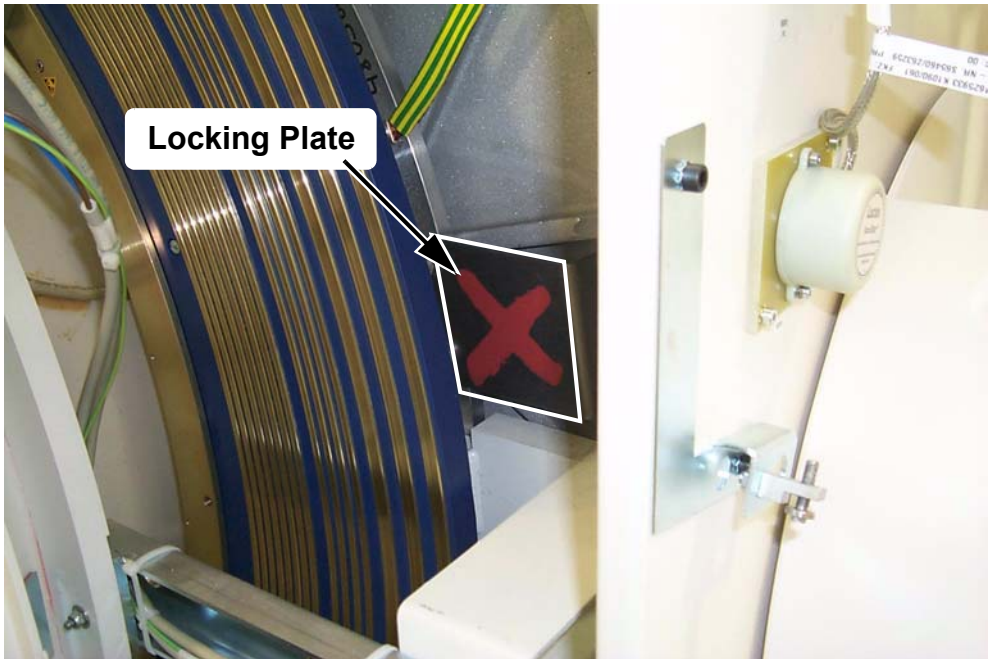

Figure 7-2: Locking Plate

3. Return the rear cover of the Gantry to its original position. Be sure to tighten the two screws that hold the cover in place.
4. From the front of the Gantry, release the four red screws that lock the rotor in place (shown in *Figure 7-3*), using an 8 mm Allen socket.

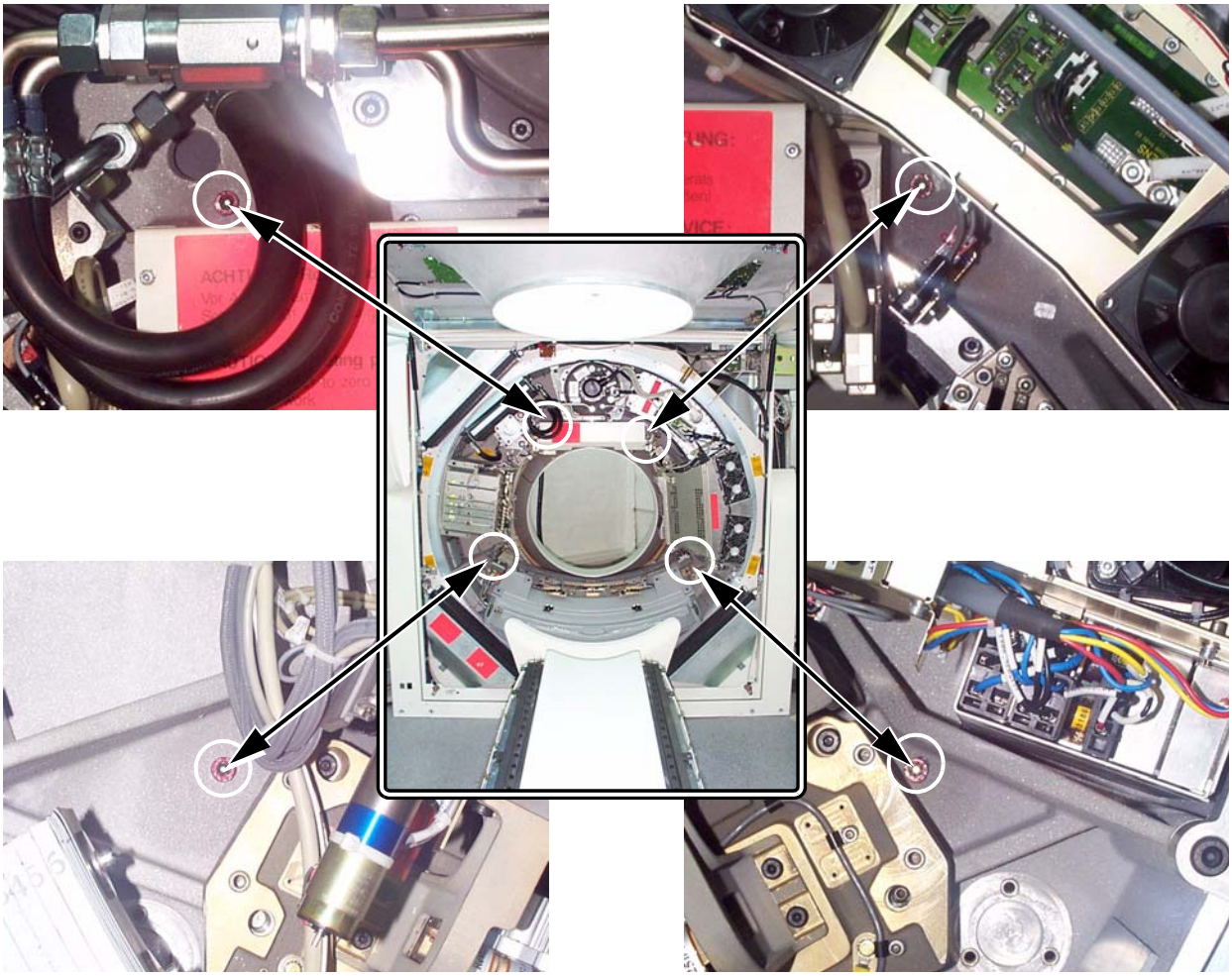

Figure 7-3: Front Gantry Locking Screws

5. Release the Locking Device located in front of the Gantry at the 2 o'clock position.

⚠ WARNING

Injury and crush hazard due to sharp edges, close clearances and/or any imbalance in the rotating frame. Use extreme caution when the rotating frame is unlocked and free to rotate. Failure to comply may result in equipment damage, serious injury or death to service personnel.

Checking the Rotor

To check the Rotor, do the following:

1. Check that all the components on the rotor are tightly secured to it.
2. Rotate the rotor two or three turns by hand, clockwise (CW). (Be careful not to hurt your hands on the sharp corners.)

   During the manual rotation, listen carefully for any noises indicating friction between components or loose parts, etc. If necessary, tighten any loose parts.

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Adapting Line Voltages

There are three terminals located in the PDC unit, where adaptation for your country power supply should be performed (see *Figure 7-4*).

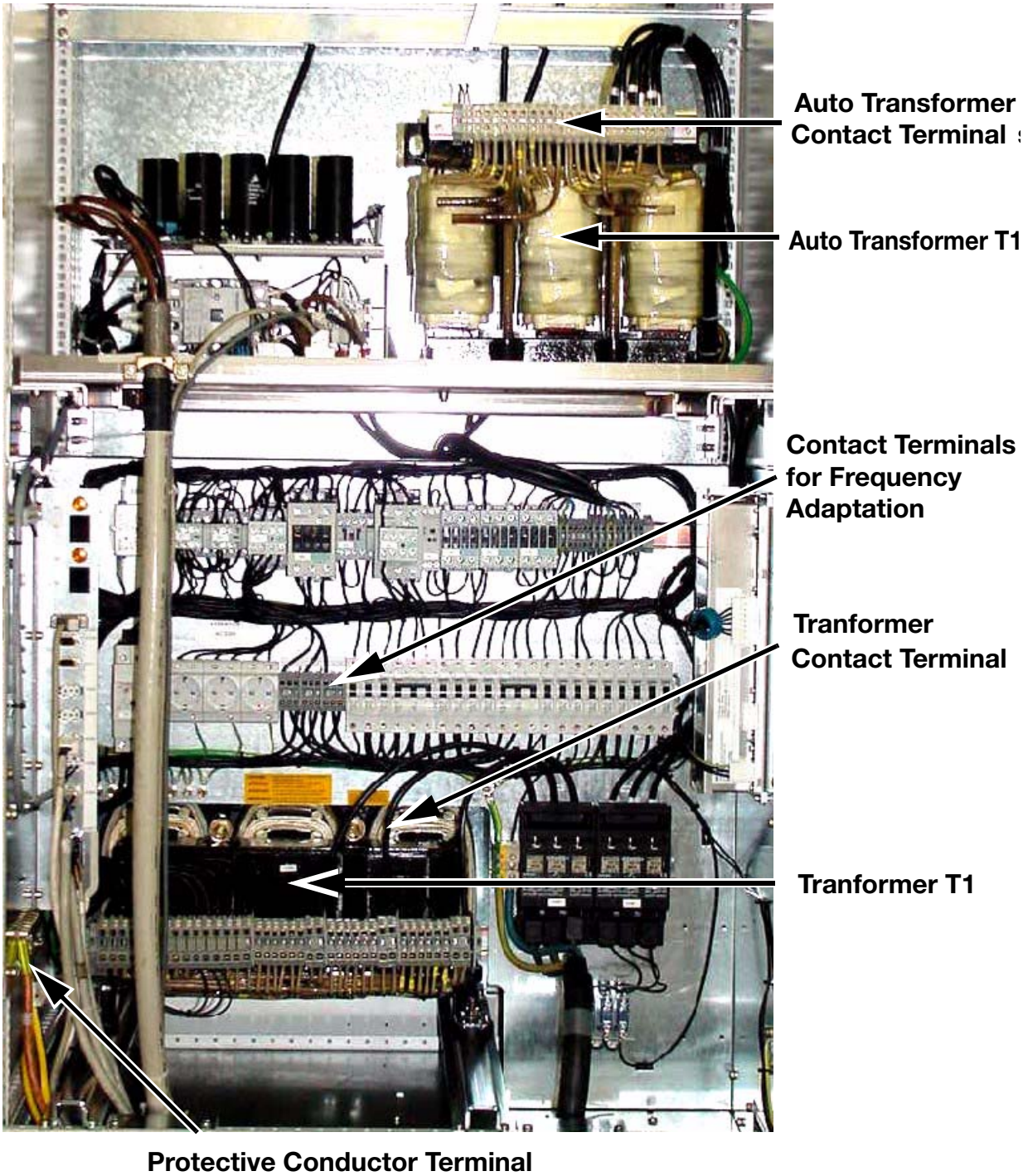

Figure 7-4: The PDC Unit and Contact Terminal Location

The contact terminals where jumpers for adaptation are located:

- On Auto Transformer T1 (see *Figure 7-5*)

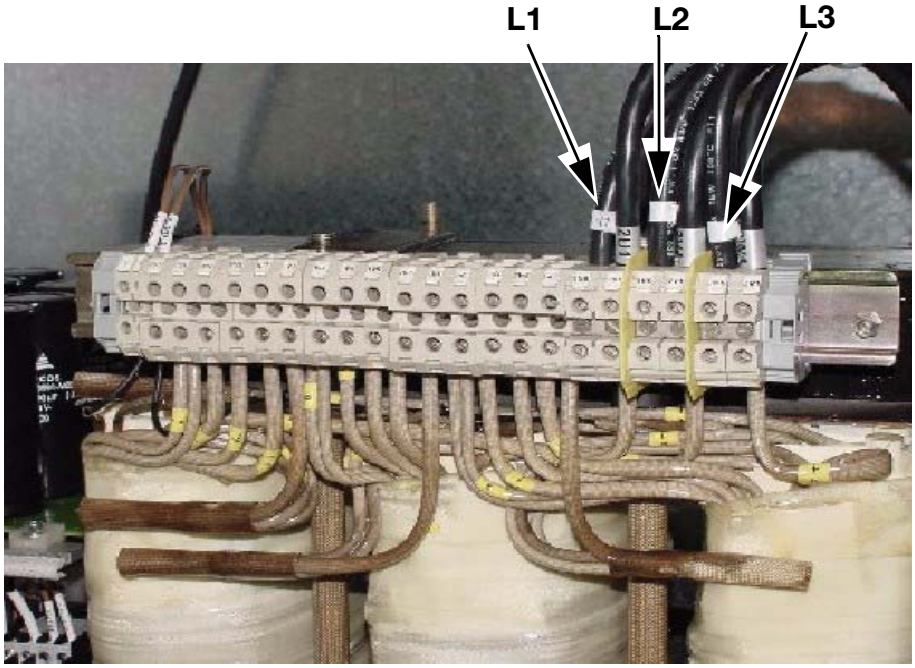

Figure 7-5: Auto Transformer T1

- Contact terminals X251(Main transformer T1)—see *Figure 7-6*

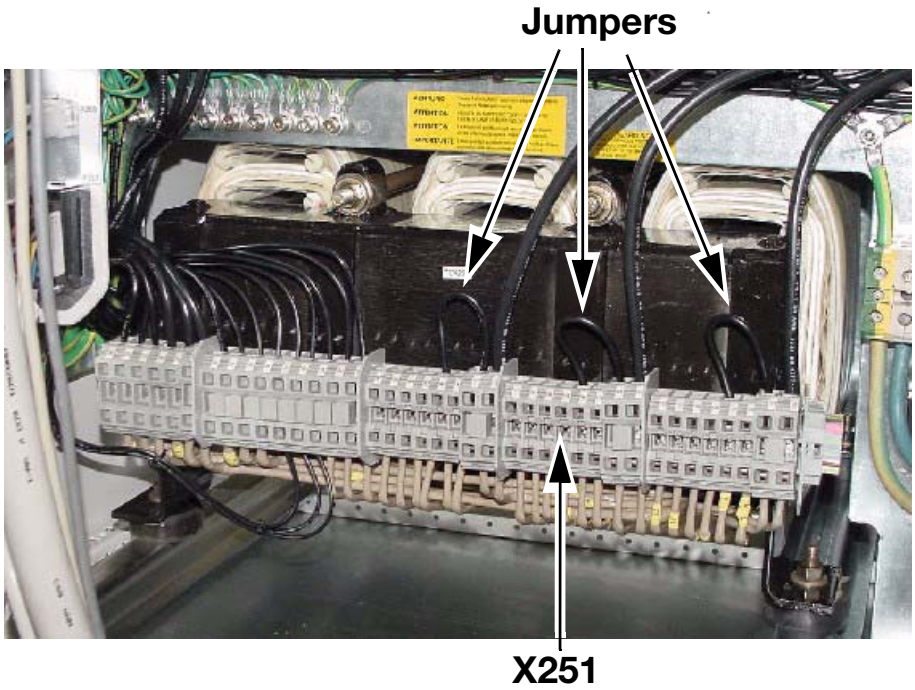

Figure 7-6: Contact terminals X251

- Contact terminals X262—see *Figure 7-7*

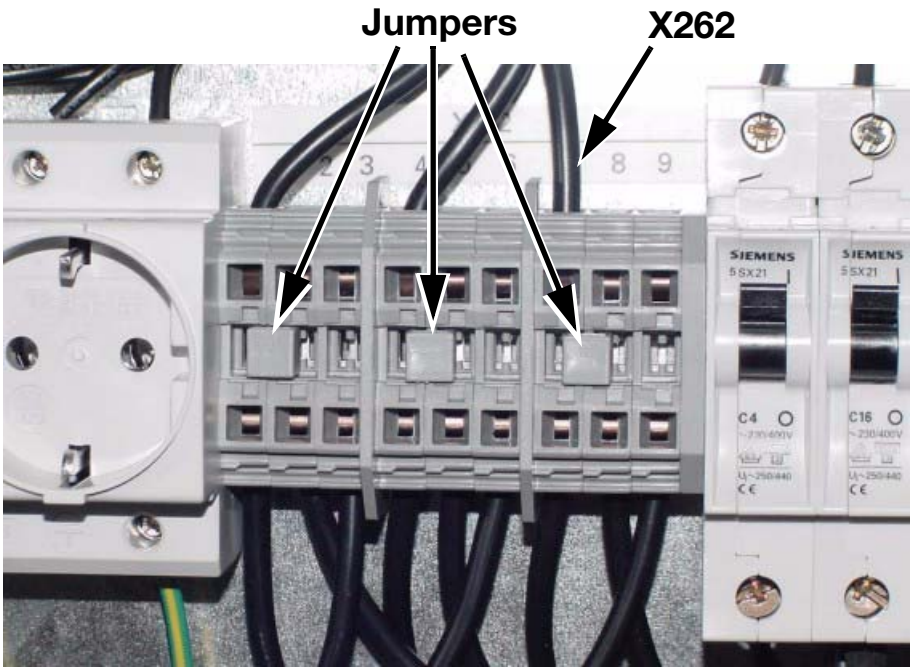

Figure 7-7: Contact terminals X262

NOTE

All systems are delivered with a factory default setting for 400V Line voltage on both the main T1 transformer and the T1 Auto Transformer.
The frequency default setting is 50 Hz.

WARNING

Before switching power of your system ON make sure that it is wired appropriately to your country's power supply.

WARNING

In case you have to perform the adaptation procedure, tighten the wires bolts enough to avoid loose contact when adapting to the local power supply.

Auto Transformer T1 Line Voltage Adaptation

The line voltage in systems delivered to the customer is set for 400V±5%. In some cases, the Auto Transformer T1 is connected. Follow the instruction in the following table to configure the system to the on-site line voltage.

AUTO TRANSFORMER T1	ON-SITE LINE VOLTAGE 400V	ON-SITE LINE VOLTAGE OTHER THAN 400V
Not Connected (see *Figure 7-11*)	No special procedure needed.	Configure the Line Voltage according to *Table 7-1* (see note below).
Connected (see *Figure 7-8*)	Perform *"Auto Transformer T1 Disconnection Procedure"* on page 7-11	Configure the Line Voltage according to *Table 7-1*.

WARNING

- If the on-site phase voltage is 400V±5%, use of the Auto Transformer is not necessary. It **must** be disconnected from the input and output lines. See *"Auto Transformer T1 Disconnection Procedure"* on page 7-11.

•If the on-site phase voltage is not 400V±5% follow the procedure below.

NOTE

If the Auto Transformer T1 is not connected, move the wires as follows:
- Wire 2U1 to Contact Terminal 1U6
- Wire 2V1 to Contact Terminal 1V6
- Wire 2W1 to Contact Terminal 1W6

The adaptation to line voltage is performed with three wires on the connection terminal located on the Auto Transformer T1.

Adjustment is performed by connecting L1, L2, and L3 wires to the 'U', 'V' and 'W' terminals according to your local line voltage and to the table glued on the top of the Auto Transformer T1 and shown on the *Figure 7-5*.

Table 7-1. Auto Transformer T1 Connections

Line Voltage	L1 / L2 / L3 Wire Position on Connection Terminal (Auto Transformer T1 in PDC)		
380V	L1—1U7	L2—1V7	L3—1W7
400V	See *"Auto Transformer T1 Disconnection Procedure"* on page 7-11		
420V	L1—1U5	L2—1V5	L3—1W5
440V	L1—1U4	L2—1V4	L3—1W4
460V	L1—1U3	L2—1V3	L3—1W3
480V	L1—1U1	L2—1V1	L3—1W1

Auto Transformer T1 Disconnection Procedure

The object of following procedure is to disconnect the input (L1, L2, and L3) and output (2U1, 2V1 and 2W1) lines from the Auto Transformer T1, and then connect the input lines to the matching output lines according to the *Table 7-2*.

Table 7-2. Input and Output Wires Connection

PHASE NUMBER	INPUT LINE LABEL	OUTPUT LINE LABEL
1	L1	2U1
2	L2	2V1
3	L3	2W1

NOTE

Tighten any wires moved with a torque of 1.2 Nm.

WARNING

- Switch OFF the system.
- Switch OFF the main input power to the PDC cabinet.

1. Open the PDC front door.
2. Open four screws and remove plastic cover in the upper part of the PDC.
3. Open six screws and remove three jumpers, shown in the *Fig. 7-8*.

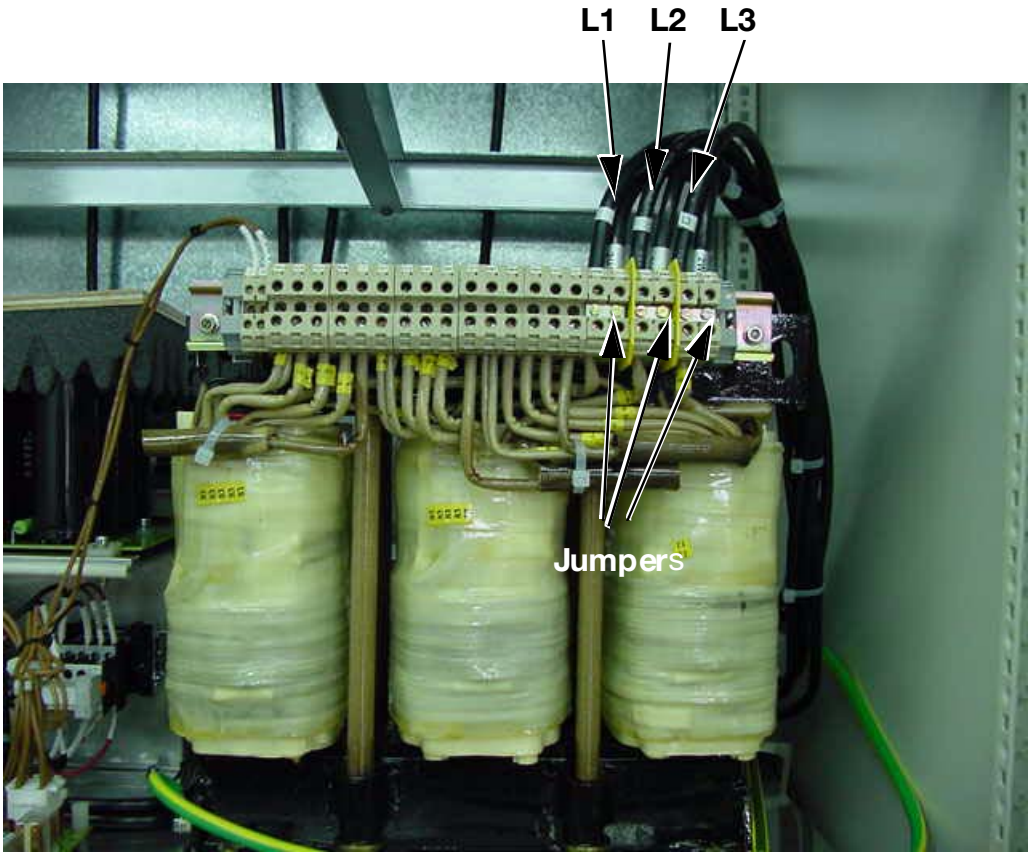

Figure 7-8: Special Jumpers Installed

NOTE

The special jumpers are shown in *Fig. 7-9*. **Do not dispose of them**. Save them on-site for the possible future use.

Figure 7-9: Special Auto Transformer T1 jumpers

4. Cut the tie wrap securing the L1, L2, L3 wires as shown in *Fig. 7-10*.
5. Loosen the three screws that secure L1, L2, and L3 wires connected to the Auto Transformer T1 as shown in *Fig. 7-10*.

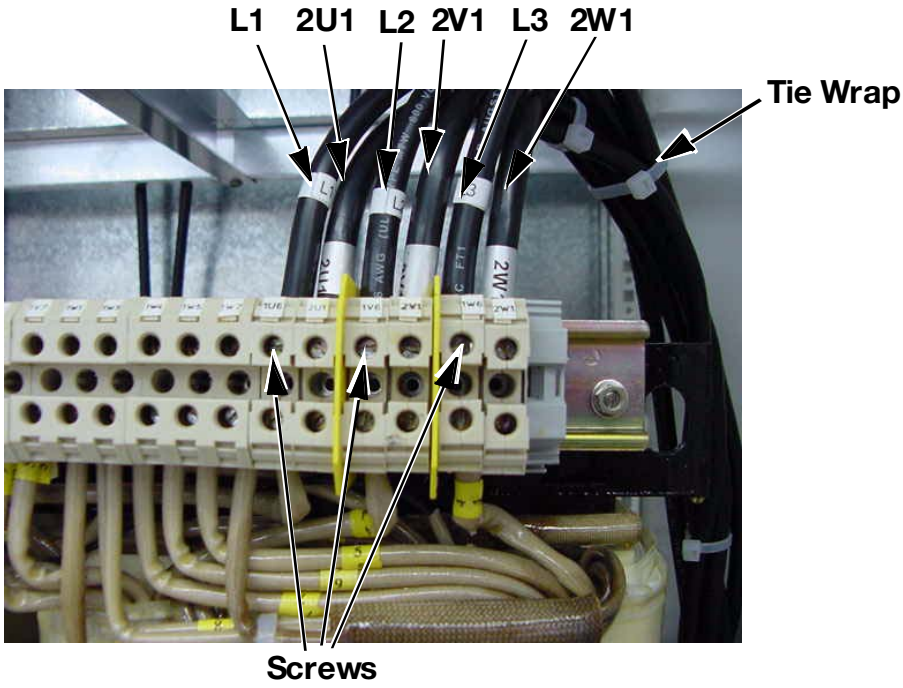

Figure 7-10: L1, L2, L3 Wires Terminals

6. Remove L1, L2, L3 wires from the terminals where they are located and insert them into the 2U1, 2V1 and 2W1 lower contact terminals accordingly (see *Fig. 7-11*).

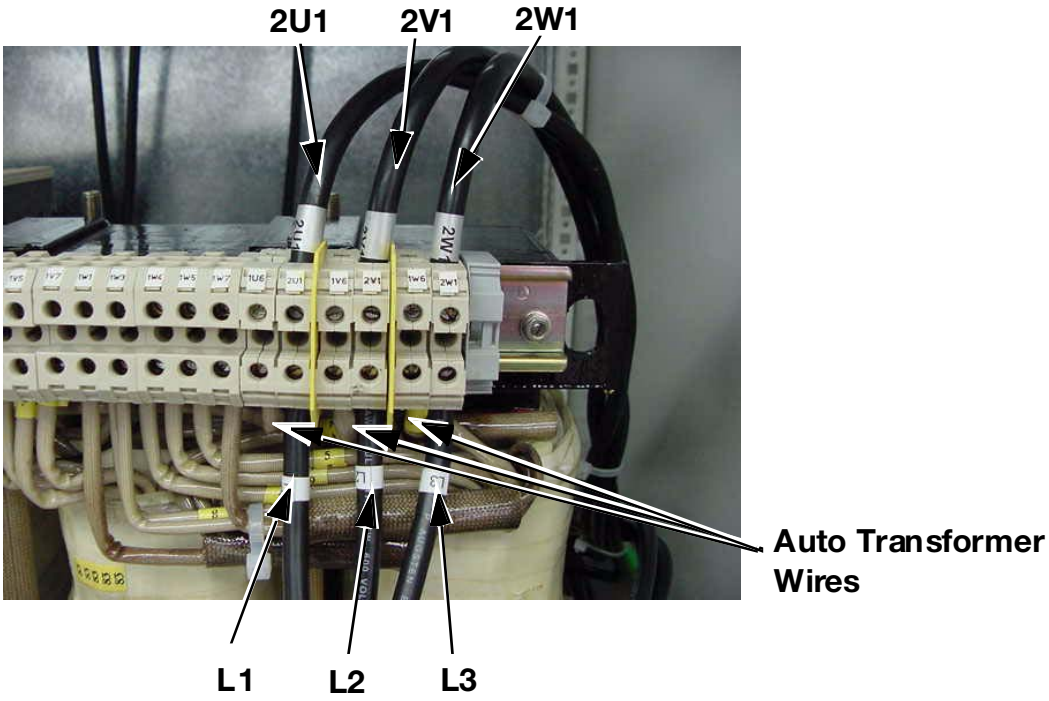

Figure 7-11: L1, L2, L3 Wires Connection

NOTE

In some systems, the transformer's wires can be connected to 2U1, 2V1 and 2W1 terminals instead of the terminals 1U6, 1V6 and 1W6. In this case, remove wires marked 2U1, 2V1, and 2W1 from their terminals, and connect them to the terminals 1U6, 1V6, and 1W6 accordingly (as shown in *Figure 7-12*). In any case, all six wires should be connected according to the *Table 7-2*.

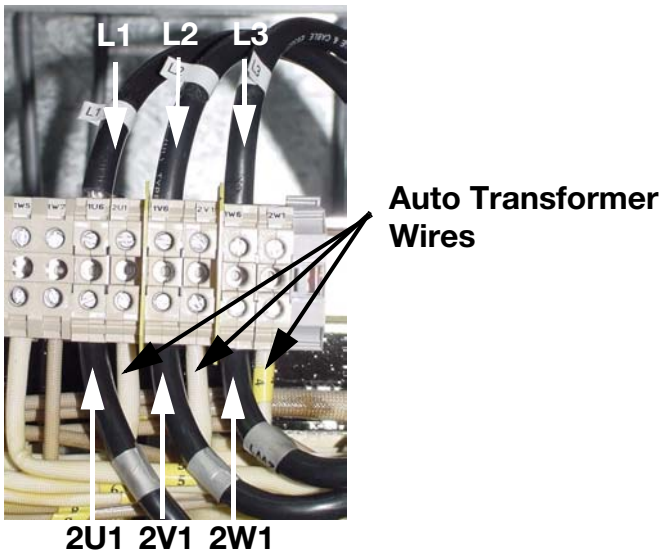

Figure 7-12:

7. Tighten the wires just moved with a torque of 1.2 Nm.
8. Install the plastic cover and close four screws.
9. Close the PDC front door.

Final Checks

1. Switch On the main input power to the PDC cabinet.
2. Switch the Gantry ON from the CT-Box.
3. Switch the workstation ON.

Perform some scans in different modes to ensure proper functioning of the system.

Main Transformer T1 Line Voltage Adaptation

Voltage adaptation is performed by three jumpers shown in *Figure 7-13* on the T1 transformer.

NOTE

To loosen a wire from the terminal, press a small flat screwdriver against the terminal while pulling or inserting the wire.

Use *Table 7-1* as a reference when adapting the system to the local line voltage:

Table 7-3. T1 Transformer Connections

Line Voltage	L1 / L2 / L3 Wire Position on Connection Terminal (Auto Transformer T1 in PDC)		
380V	1U1—1W3	1V1—1U3	1W1—1V3
400V	1U1—1W4	1V1—1U4	1W1—1V4
420V	1U1—1W5	1V1—1U5	1W1—1V5
440V	1U1—1W6	1V1—1U6	1W1—1V6
460V	1U1—1W7	1V1—1U7	1W1—1V7
480V	1U1—1W2	1V1—1U2	1W1—1V2

System Line Frequency Adaptation

Adapt the system to the line frequency by putting jumpers on the X262 mains terminal in the PDC as shown in *Figure 7-13* and in *Table 7-4*.

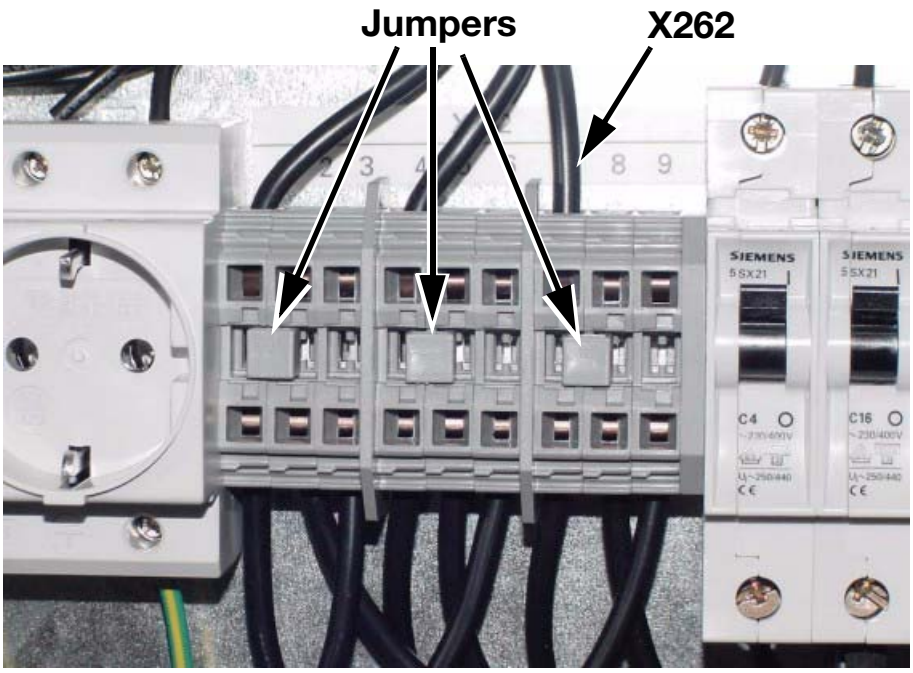

Figure 7-13: Jumpers on the X262 Mains Terminal

NOTE

To move the jumpers, use a long nose pliers.

Use *Table 7-4* as a reference when adapting the system to the line frequency.

Table 7-4 Jumpers on the X262 Mains Terminal

For this Line Frequency	Insert Jumpers Here
50 Hertz	Between terminals 1 and 2 Between terminals 4 and 5 Between terminals 7 and 8
60 Hertz	Between terminals 2 and 3 Between terminals 5 and 6 Between terminals 8 and 9

Checking the Protective Conductors

Check the protective conductor connections to all central protective conductor points in the system components.

Measure the resistance from the protective conductor terminal in the PDC to the system components listed in *Table 7-5*. The resistance from the protective conductor terminal of the PDC to any one system component must be £ 100 mW.

Table 7-5. Protective Conductor Resistance to Measure

Measure from this Point	To this System Component
Protective Conductor Terminal of the PDC (see *Figure 7-4* on page 7-6)	Computer Rack Heat Exchanger Right Leg of the Gantry

Connecting to Power and Ground Points

WARNING

Electrocution hazard—use extreme caution when operating or working on equipment with covers removed. Dangerous voltages are exposed when the Gantry covers are removed. Contact with these voltages may cause serious injury or death to personnel.

The Mx8000 meets worldwide main power supply requirements.

In addition, the company recommends that the power source be independent of all other loads. It should not provide power for any additional equipment, such as air conditioners, elevator compressors, and others. All transformers must have sufficient capacity to handle future expansion

NOTE

The company's electrical line requirements are in addition to the local electrical line regulations.

To connect the system to the power and ground connection points, do the following:

1. Measure the resistance between the common point and the true earth point. It must be less than 1W.
2. Connect the Additional Protective Earth (APE) cable that extends from the PDC to the ground connection point provided by the customer.

3. If your system has a plug and a receptacle, connect the receptacle from the PDC to the main power supply. Otherwise, connect the main power supply cable to the local power supply board.

   Shorten the supply cable to the length required, so that there is no excess cable. Cut the cable to the needed length at the end of the cable that will be connected to the local power supply board. Use a strip knife to remove the insulation and expose the wires. Insert the exposed part of each wire into a metal tube (attached to the cable), and press the tube until it holds the wire securely.

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Chapter 8
First Time System Operation

This chapter describes how to turn on the Mx8000 system, and the things to check when you do.

It describes the following:

- Safety measures that should be in effect.
- How to check the emergency shutdown buttons.
- The steps involved in turning on the system, in correct order.
- Checks to perform to ensure that everything is operating correctly.

Safety Measures

Before switching ON the system, check that the following are true:

- All mains cables, protective conductors and system cables are connected.
- All radiation ON indicators provided by the customer are installed and connected.
- The power distribution system has been adapted to the local line voltage and line frequency (as described in the installation instructions).
- The protective conductor measurement has been performed and the results are within the specified tolerance.
- The rear cover of the Gantry is closed.
- The on-site emergency shutdown button has been checked and is functioning properly.
- All radiation protection measures have been taken.
- The CT site has been cleaned.
- No one is in the scanner room.
- The S301 located on the right front side of the Gantry is in 0 position (rotation is disabled).

Checking the Emergency Shutdown Buttons

Every site must have emergency shutdown buttons that cut OFF all power to the system. Use the following procedure to check these buttons:

1. Open the Power Distribution Cabinet (PDC) and verify that ***all*** circuit

breakers are in the OFF position.

2. From the wall outlet, switch ON the power to the PDC.

WARNING

Line voltages are now present in the system.

3. Measure that all three phases reach the PDC. (Check the voltages between each pair of phases, and each phase with respect to the ground.)
4. Press an emergency shutdown button and make sure that no power reaches the PDC.
5. Return power to the system.
6. If you have more than one shutdown button, repeat steps *4* and *5* for each one.

Protection Kit Functionality Test (Only For systems equipped with the PDC Auto Transformer Protection Kit)

1. Switch ON F99 breaker (on the protection kit). First move the breaker to the OFF position and than to the ON position. This action requires extended force.
2. Verify that F1 and F9 breakers in the PDC are switched ON.
3. Switch the power ON using the on-site ON/OFF switch.
4. Verify the status of the K101 and K100 LEDs as follows:

	GREEN (230V)	YELLOW (ORANGE)	YELLOW
K101	ON	ON	N/A
K100	N/A	OFF	OFF

5. If one of the LEDs is in the wrong state, switch the power OFF and ON with the on-site ON-OFF switch.
6. If there is still the problem, switch OFF all power and check all the wiring according to the installation procedure.

WARNING

Follow all safety precautionary warnings as listed in the beginning of this document.

7. If the LEDs status is OK, press the S100 test key (*Fig. 8-1*) at least 2 seconds.
8. The main breaker F99 must trip OFF to the middle position.
9. To switch the F99 breaker ON, first move the breaker to the OFF position and than to the ON position. This action requires extended force.
10. In the case of a faulty main breaker assembly, order a new kit.

NOTE

K101 LEDs Status (both LEDs ON in normal operation)
K100 LEDs Status (both LEDs OFF in normal operation)

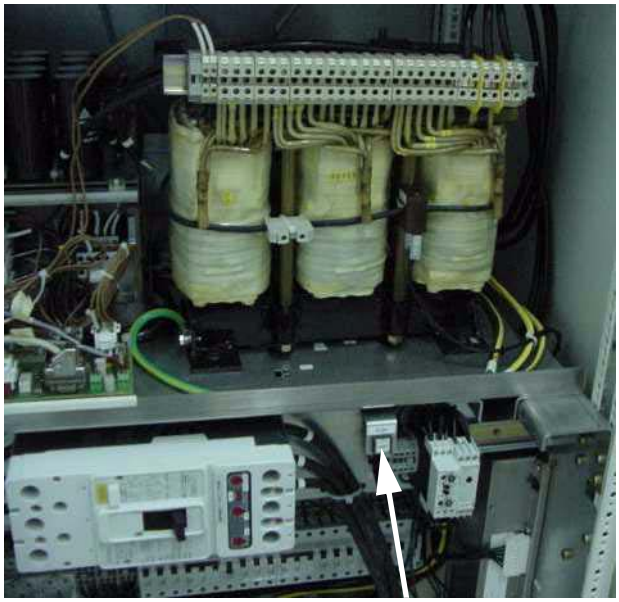

Figure 8-1: S100 Test Key

System Turn-on Sequence

Turning on the Mx8000 includes the following:

- Checking the power supply.
- Turning on the circuit breakers.
- Checking operation of the components.

Checking the Power Supply

Phase Sequence Check

Before turning ON the Mx8000, do the following:

1. Use a phase sequence meter to check that the phase sequence is correct.

   Connect the meter in the PDC to the three phases (L1, L2, L3) that are located below F200, as shown in *Figure 8-2*. The phase sequence is correct only if the field rotates to the right.

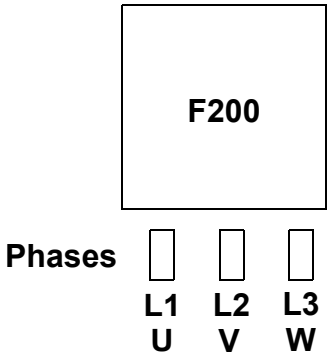

Figure 8-2: Location of Phases L1, L2 and L3

2. Check the secondary voltage between points on terminal T1, which is the main transformer in the PDC.

   Make sure it is as described below and as shown in *Figure 8-3*:

   - 400 V ± 10% between any two of the following points: 2U3, 2V3 and 2W3.
   - 460 V ± 10% between any two of the following points: 2U2, 2V2 and 2W2.

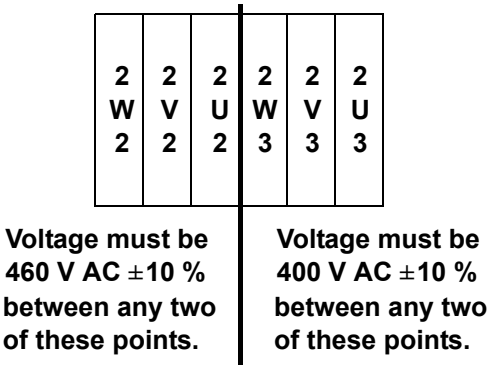
2W2
2V2
2U2
2W3
2V3
2U3
Voltage must be 460 V AC ±10 % between any two of these points.
Voltage must be 400 V AC ±10 % between any two of these points.

Figure 8-3: Required Voltages Between Points on Terminal T1

Line Impedance Check

Refer to *Appendix A, Electrical Line Inspection* for the procedure on checking the electrical line impedance and corrective action.

Circuit Breakers

Turn ON the circuit breakers, as follows:

1. Verify that S1 and S2 in the PDC are in down positions.
2. Verify that all circuit breakers are OFF.
3. Switch ON the main circuit breaker (F1).
4. Switch ON F4, F3, F18 and F23 to supply the central 24 DC voltage.
5. Verify that the green LED on the 24 V power supply in the PDC is ON.

6. Switch ON F5 to supply voltage to the computer.
7. Switch ON F8 and F9 to supply voltage to the Gantry.
8. Switch ON F15 and F16 to supply voltages to the Patient Table (PHS).
9. Switch ON F22 to supply voltage to the PDC fan.
10. Switch ON F10 to supply voltage to the Direct Current Controller (DCC) fan.
11. Switch ON F12 to supply 24 DC voltage to the DCC control board.
12. Switch ON F14 in the PDC to supply voltages to the Heat Exchanger.
13. Verify that all the circuit breakers and fuses in the left leg of the Gantry are in their ON positions.

Table 8-1 shows the which circuit breakers must be ON when the computer is ON, which must be ON when the system is ON, and which must be ON all the time.

Table 8-1: Circuit Breaker Settings in the PDC

Circuit Breakers to Turn ON				Voltage		Computer ON	System ON	Permanent
F1	F4	F5		230 V	**Computer Rack**	☑		
F1	F23	F8		230 V	**Gantry**		☑	
F1	F23	F9		230 V	**DMS**			
F1		F10		230 V	**DCC Fan**		☑	
F1		F11		230 V	**Reserved**	☑		
F1	F23	F12		24 V	**DCC Board**		☑	
F1(50Hz)		F14		230 V	**WCS**		☑	
F1	F8	F15		230 V	**PHS1**		☑	
F1	F8	F16		230 V	**PHS2**		☑	
F1	F4	F17		230 V	**Computer**	☑		
F1	F4	F3	F18	24 V	**CT Box**			☑
F1		F19		230 V	**Control1**	☑		
F1		F20		230 V	**Control2**	☑		
F1		F21		230 V	**Second Monitor**	☑		
F1		F22		230 V	**PDC Fan**	☑		

Checking LEDs in the Gantry

To check proper operation of the LEDs in the Gantry, do the following:

1. Verify that the power switch of the Image Reconstruction System (IRS) is ON.
2. Turn the switch in the upper right corner of the Computer Rack to the ON position.
3. Press the operating button on the front panel of the O2 computer, and verify that the LED on the front panel of the O2 computer turns green after a few seconds.
4. From the Scan Control Unit, turn ON the Gantry.
5. Verify the following in the Gantry:

⚠ WARNING

First make sure that rotation is disabled, i.e., S301 is in position 0.

- All four LEDs on DPU2 are green.
- Six LEDs on DPU1 are green.
- LEDs on DELPHI, +5V, +24V, +15V and -15V, are green.
- LEDs on Z_CON, +5V and +24V, are green.
- LED on R_COM, +5V, is green.
- LED on ACU, +5V, is green

Checking Fans in the Gantry

Check that the following fans are working:

- Two on Heat Exchangers of the tube.
- Two on each of the three radiators in the Gantry.
- Two on the Data Measurement System (DMS).
- Four in the high voltage electronic box.
- Two on the high voltage transformer unit.
- One fan on the C-Box.

Defining the Cooling Unit Type

The type of cooling unit used is defined in the T0A table of the Mx8000 Software.

NOTE

Cooling unit type defined in all systems delivered is Water-Water type.
In case that Water-Air type will be used, you should define this in T0A table.

Insert the required information as follows:

1. Login in the system as **Mx8000.**
2. Click **Service** on the menu bar.
3. Choose **MCU_Utilities|Edit Table|Update**
4. Select T0A table from the list and press **<Enter>.**
5. Correct the T0A table according to your hardware configuration as follows:

T0A WCS Parameters for Water-Air Exchanger

```
send 0x00 T 0x0a 0x01 0x18 0x00 0xAA 0x02 0x00
send 0x00 T 0x0a 0x00 0xB9 0x17 0x70 0x0f 0x01
send 0x00 T 0x0a 0x01 0xf4 0x01 0x2c 0x00 0x02
send 0x00 T 0x0a 0x00 0x00 0x00 0x00 0x00 0xff
```

T0A WCS Parameters for Water-Water Exchanger

```
send 0x00 T 0x0a 0x01 0x18 0x00 0xAA 0x01 0x00
send 0x00 T 0x0a 0x00 0xB9 0x17 0x70 0x0f 0x01
send 0x00 T 0x0a 0x05 0x14 0x00 0x64 0x00 0x02
send 0x00 T 0x0a 0x00 0x00 0x00 0x00 0x00 0xff
```

6. Click **Update** and than **Exit** buttons.
7. Logout and then login to the system for the change to take place.

Checking Bed Movement

Check movement of the bed as follows:

1. Make sure the stretcher is out as far as possible.
2. In the Service Switch Panel of the Patient Table (front lower right side), switch to Service (position 1).
3. Move the Patient Table UP and DOWN.

NOTE

Do not move the Patient Table to its lowest or highest position.

During the UP and DOWN movement, check that the scissors do not make contact with the semi-circular washers, and do not damage any cables. Leave the Patient Table in a low (but not the lowest) position.

4. In the Service Switch Panel, switch back to Normal (position 0).

Checking Rotation

Use the following procedure to check rotation:

1. Switch S301 to the 1 position to enable rotation.

WARNING

Make sure that there is no one near the Gantry during rotation.

2. In the RTC unit, put switch number V67 to the Service position (UP), press the yellow button (S11) and press the CW button. Watch the Rotor as it moves. You should not hear any unusual noise. Also, make sure there are no loose parts.
3. Press the CCW button. Check again for unusual noise or loose parts during counterclockwise rotation.
4. Press the red button (S12) and return switch number V67 back to the Normal position (DOWN).
5. Close the front cover of the Gantry and lock it with the two Locking Screws.

Checking Movement from the Gantry Panel

Use the following procedure to check movements from the Gantry panel.

1. On the computer, double-click on the Mx8000 icon to log in to the Mx8000 software.
2. When the log in process is finished, verify that the movements are enabled, that is, the LEDs on the Gantry panel are ON.
3. Check all movements from the Gantry panel, that is, UP and DOWN, IN and OUT, MARKERS ON and MARKERS OFF, and TILT. All movements should be smooth and you should not hear any unusual noise.

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NOTE

The LEDs in the Gantry panel are ON only when the corresponding movement is enabled. If the LED is OFF, the movement is disabled due to the safety envelope.

Checking Movement from the Scan Control Unit

Use the following procedure to check movements from the Scan Control Unit panel.

1. Verify that the movements are enabled, that is, the LEDs on the Scan Control Unit panel are ON.
2. Check all movements from the Scan Control Unit panel, that is, UP and DOWN, IN and OUT, and TILT.

NOTE

The LEDs in the Scan Control Unit panel are ON only when the corresponding movement is enabled. If the LED is OFF, the movement is disabled due to the safety envelope.

Gantry Safety Checks

Perform the following Gantry Safety Checks:

A. Gantry Front Cover Safety Switches Check
B. Rotation Safety Switch S301 Check
C. Gantry Rear Cover Safety Switch Check

Gantry Front Cover Safety Switches Check

Perform this check as follows:

1. Make sure that the Gantry front cover is closed and that the two screws that close the cover are tightened securely.
2. Perform any rotation scan.
3. While the rotor is rotating, loosen any of the Gantry front cover screws.
4. Make sure that the rotation is stopped and that the system goes through STOP and STANDBY states.
5. Tighten the previously loosened screw.
6. Repeat steps 1–5 for the second Gantry front cover screw.

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Rotation Safety Switch S301 Check

Perform this check as follows:

1. Open the Gantry front cover.
2. Turn the S301 switch OFF (0 position).
3. Close the scanning room door.
4. Perform any rotation scan.
5. Verify that the rotor is not rotating and that the message **Initialization is Failed** appears on the workstation monitor.
6. Turn the S301 switch ON (1 position).
7. Perform any rotation scan.
8. Verify that the rotor is rotating.

Gantry Rear Cover Safety Switch Check

⚠ WARNING

Do not open and remove the rear cover **completely**. Hazardous voltage levels (560VDC) can be present even if the system is switched OFF.
Refer to Section *" Safety Precautions Before Opening the Gantry Back Cover"* before opening the Gantry rear cover if removal is necessary.

Perform this check as follows:

1. Turn the Gantry ON from the CT-Box.
2. Loosen the screws on the Gantry rear cover and slightly open the cover.
3. Make sure that the Gantry power has been switched OFF and that any LED on the Gantry Stationary or Rotating part is not illuminated.
4. Close the Gantry rear cover and tighten the two screws.
5. Turn the Gantry ON from the CT-Box and make sure that the LEDs on the Gantry Stationary or Rotating part are illuminated.

Checking the Door Contact Switch

If a door switch was installed, perform this test to check whether the switch interrupts radiation when the door is opened.

To perform the test, do the following:

1. Select any spiral protocol with radiation.
2. Press **Manual Scan**.
3. Open the door that has the switch.

The switch passes the test if scanning stops immediately and an appropriate message appears on the screen.

Checking the Radiation Indicators

This test checks all radiation ON indicators. To perform the test, do the following:

1. Select any scan mode with radiation.
2. Press **Manual Scan**.
3. Check the following radiation ON indicators:
   - Two indicators on Gantry panels.
   - One indicator on the CT-Box
   - One indicator on the monitor.
   - Any X-ray ON indicator lamps installed at the site.

Any indicator that is not ON during the scan fails the test.

Checking the Emergency Stop Buttons

This test checks whether all motor-driven system movements are stopped when any emergency **STOP** button is pressed.

From the host computer, load an axial scan.

Then perform the test as follows:

1. When **Manual Scan** appears, press a red emergency **STOP** button.

   The button passes the test if all of the following occur:
   - All motor-driven system movement stops.
   - The system does not allow another scan until the system is reset.
2. Reset the Gantry. From the Main menu, click **Service | MCU Utilities | Reset Gantry**.

Reload the axial scan and repeat the test for each emergency **STOP** button, i.e., on both sides of the Gantry control panel and on the CT box.

Checking the Safety Limit Switches

Safety limit switches stop horizontal Couch movement when the foot of the top support encounters an obstacle or when something gets between the Gantry and the Couch on the footswitch.

There are six safety limit switches (under cover plates) as follows:

- Four switches are on the connecting frame (left picture in *Figure 8-4*).
- Two switches are on the foot of the Couch (right picture in *Figure 8-4*)

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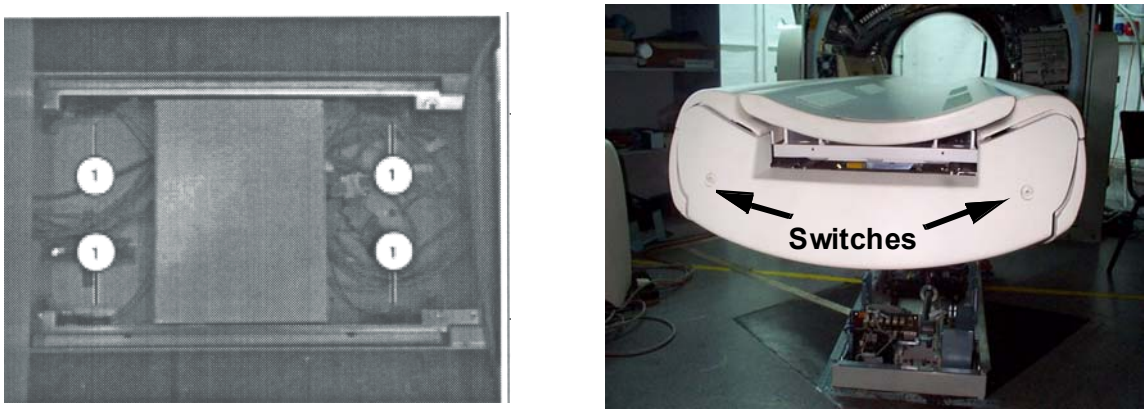

Figure 8-4: Limit Switches

To check the safety limit switches, do the following for each switch:

1. Activate the limit switch by pressing the cover plate over the position that corresponds to the switch. You should hear a distinct click sound.
2. Verify that the buttons that enable horizontal movement are all disabled.

Repeat these steps for each safety limit switch.

Checking the Patient Positioning Accessories

Patient positioning accessories include such parts as the head cradle, holder and pads.

Check the condition and attachment of patient positioning accessories as follows:

1. Inspect each accessory for damage.
2. Inspect the bracket at the head of the Couch for damage.
3. Check the lock mechanism of each accessory. Attach and remove each accessory several times until you are sure that it can be safely and securely positioned on the Couch.

If the lock mechanism does not work properly, determine the cause and correct it, e.g., replace spring, knob or bracket.

Long TC

Perform Long Tube Conditioning as follows:

1. Login the system.
2. On the menu bar, click **Misc**|**Tube Conditiong**|**Long Tube Conditioning.**
3. Follow all instructions given by the system.

Final Patient Table Alignment

Align the Patient Table as follows:

1. Raise the Patient Table to the estimated middle of the scan circle.
2. Insert the stretcher into the Gantry scan circle.
3. Measure the distance from the left edge of the stretcher to the Gantry front cover. Make sure the measurement is a diagonal straight line.
4. Measure the distance between the right edge of the stretcher to the Gantry front cover. Make sure the measurement is a diagonal straight line.
5. Compare the distances in steps *3* and *4*, and if necessary move the Patient Table until they are equal.
6. Attach the system phantom to the stretcher and perform a surview scan.
7. Put the grid on the image and check that the phantom is in the center of the scan circle.
8. If necessary, move the Patient Table until the phantom is in the center of the scan circle.
9. Tighten the five anchoring screws of the Patient Table.

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Adjustment of the Cover Laser Light Markers

Adjustment of the stator laser light markers may be necessary if you have removed the Gantry cover when transporting the Gantry through narrow spaces. Use the following procedure to align the light markers:

1. Close the Gantry front cover and tighten the two screws.
2. Turn the Gantry ON.
3. Turn the light marker ON from the gantry panel.
4. Position the system phantom in the middle of the scan circle (couch height approximately 125mm) so that the light falls on one of the notches on the phantom (*Fig. 8-5*).

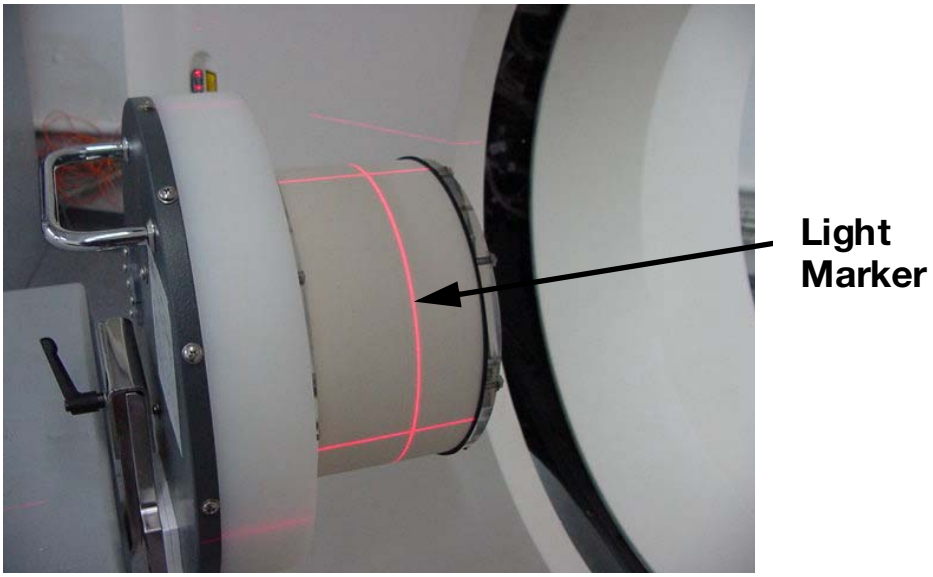

Figure 8-5: Light Markers on System Phantom

Verify a continuous line on the system phantom. If the line is duplicate, adjust the light marker as follows:

1. Cover one of the light markers to find out which one needs calibration.
2. Open the Gantry front cover. and adjust as follows (see *Fig. 8-6*):

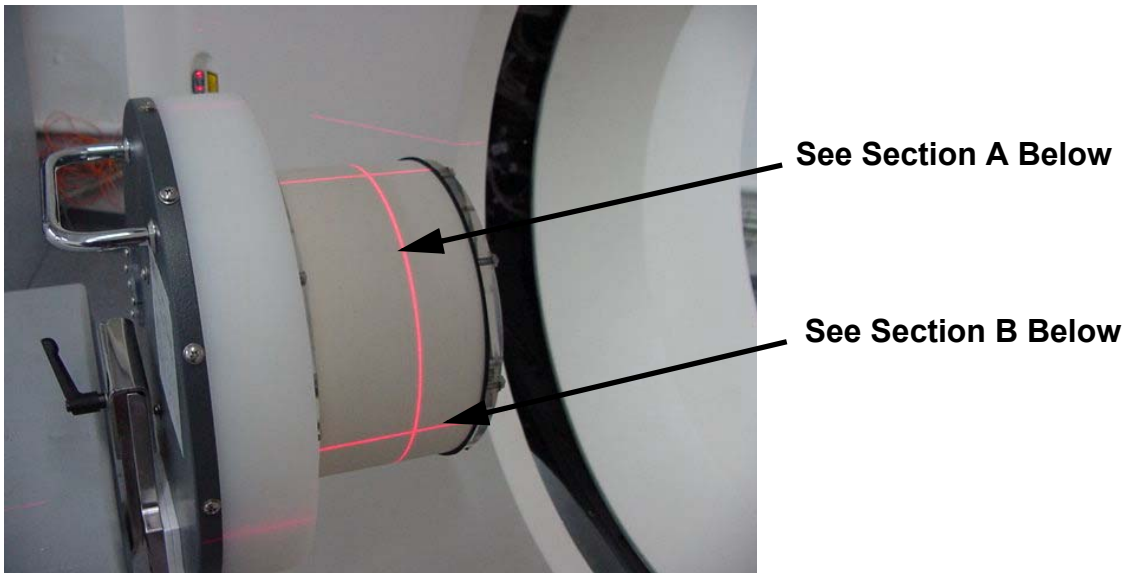

Figure 8-6:

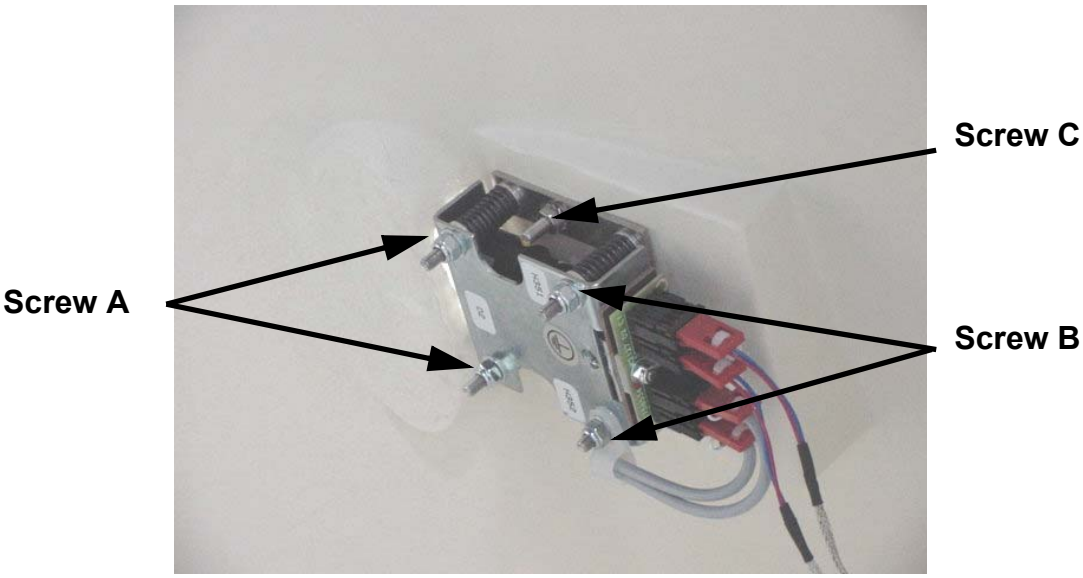

Figure 8-7:

A. If the line is duplicate, adjust it with screws A and B (*Fig. 8-7*).
B. If the line is duplicate, adjust it with screw C (*Fig. 8-7*).

Final Steps

1. Turn the service switch S-301 to 1.
2. Close the Gantry door and carefully insert the mylar gasket.
3. Turn the light markers ON. Verify that the light markers line up on the system phantom.

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Chapter 9
Completing the Installation

This chapter explains how to complete the installation of the Mx8000, including, closing system covers, installing the network and configuring the network.

Closing System Covers

Closing all system covers includes the following:

- Covers in the left leg of the Gantry
- Cover of the Connection Piece
- Upper and lower covers for the left and right legs of the Gantry
- Patient Table covers
- The protective Mylar gasket for the Gantry
- Duct covers

Covers in the Left Leg of the Gantry

Close covers in the left leg of the Gantry as follows:

1. Close the MCU cover as follows:
   a. Slide the cover into place.
   b. Lock it in place by rotating the four screws each a half turn to the right.
2. Reinstall the metal plate and close all screws using a 3 mm Allen key.

Connection Piece

Close the cover of the Connection Piece, as follows:

1. Put the cover into place.
2. Connect the grounding cable to the cover.
3. Close the four screws that hold the cover in place.

Upper and Lower Gantry Leg Covers

Close the leg covers for the Gantry as follows:

1. Remove the upper covers of the left and right legs of the Gantry, as follows:
   a. Insert a small screwdriver into the small hole in the back of the cover (indicated in *Figure 9-1*), and loosen the inner screw by turning it clockwise. It will not come out.

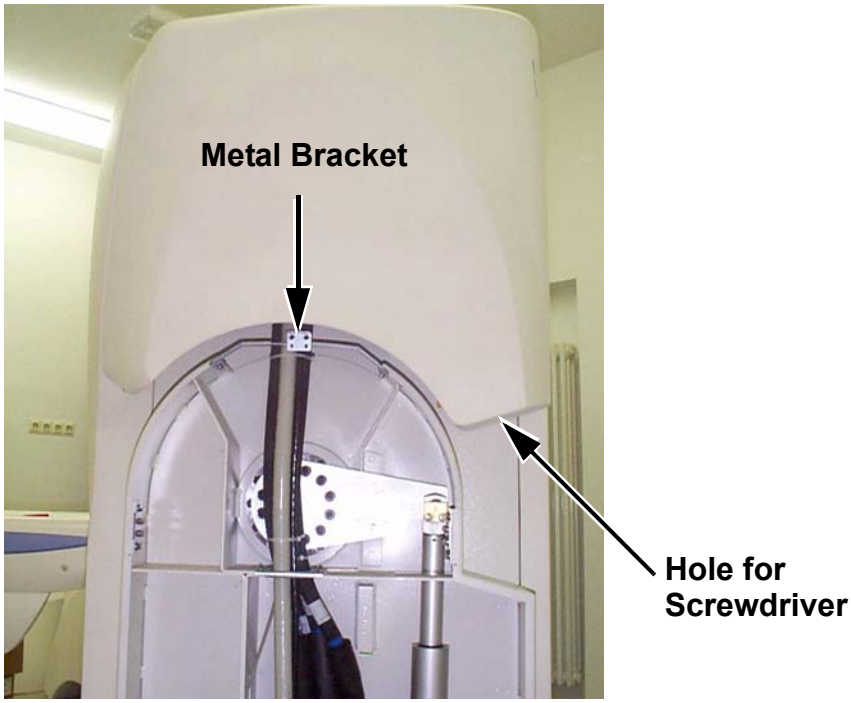

Figure 9-1: Right Leg of Gantry without Lower Cover

   b. Pull the lower part of the cover away from the Gantry, and then lift it up.
   c. Put the cover aside in a safe place.
2. Put on the two lower leg covers, as follows:
   a. Remove the screws from the metal bracket (shown in *Figure 9-1*). These screws will secure the cover in place.
   b. Remove the lower leg covers from their packing case. The cover for the left leg has a round hole on its back
   c. Put a lower leg cover in place (see *Figure 9-2*), and lift it a few centimeters. Bring the cover closer to the Gantry, and lower it. Make sure that both notches in the inner side of the cover are in their correct places.

Figure 9-2: The Gantry Leg Covers (right leg shown)

d. Push the lower part of the cover against the Gantry until it snaps into place.

e. Verify by hand that the cover is firmly secured in place.

f. Put the other lower leg cover in place in the same way.

g. Secure the lower covers in place with the screws you removed in step *a*.

3. Close the two upper leg covers, as follows:

a. Lift a cover above the height of the Gantry, and lower it into place so that the two notches are in place.

b. Push the lower part of the cover towards its correct position until it snaps into place.

c. Use a small screwdriver to secure the cover into place (see *Figure 9-1*) by turning the inner screw counterclockwise (CCW).

d. Close the other upper leg cover in the same way.

Patient Table Covers

Put the Patient Table Covers in place, as follows:

1. Lower the Patient Table and slide the lower part of the bellows into its groove by hand.

2. From the back of the Patient Table and with the cover touching the floor, slide the cover of the Patient Table base toward the Gantry until it is in its correct place. (See *Figure 9-3*.)

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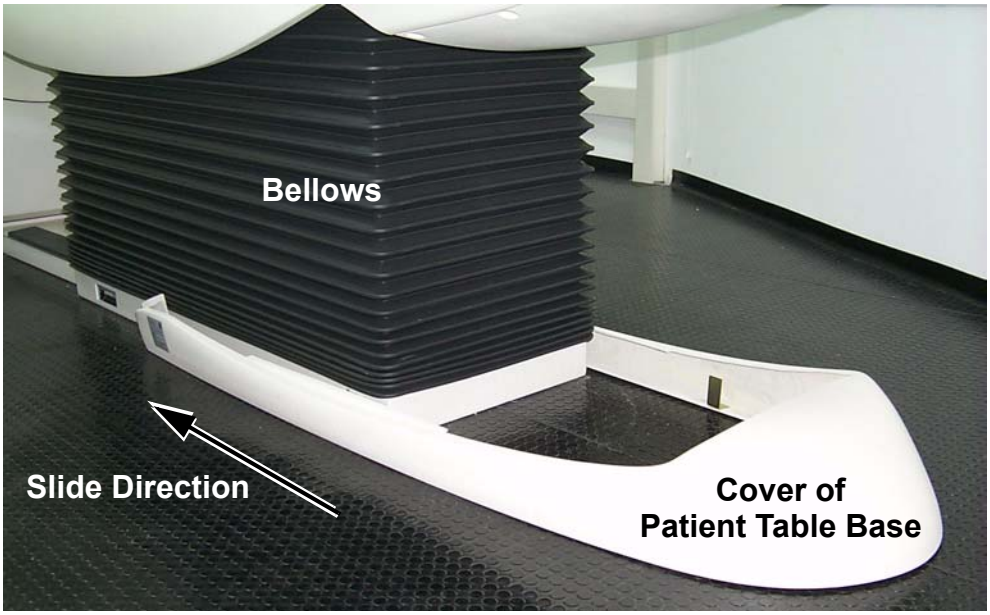

Figure 9-3: Bellows and Cover of Patient Table Base

3. Attach the rear stretcher cover to the rear panel of the stretcher as shown in *Figure 9-4*, using the two screws provided.

Figure 9-4: Rear Stretcher Cover

4. Raise the Patient Table and move the stretcher IN as far as it goes.
5. Unpack the metal cover for the Patient Table, and slide it into its place as shown in *Figure 9-5*.

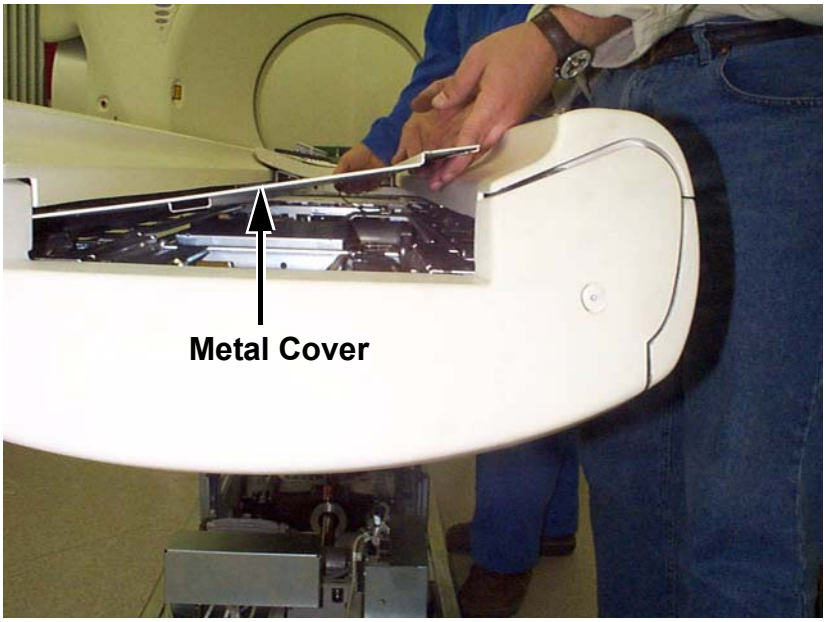

Figure 9-5: Sliding the Metal Cover of the Patient Table into Place

6. Connect the Ground cable coming from the Patient Table to the metal cover.
7. Secure the metal cover in place by closing the six screws, using a 2.5 mm Allen key.

Installing the Mylar Gasket

The Mylar gasket is a sealing strip that protects the Gantry by preventing liquids from getting into it.

Install the Mylar gasket as follows:

1. Loosen the two screws that lock the front cover of the Gantry in place until only two or three threads are holding it.
2. Measure the gap between the front and rear covers. The gap should be 66–72mm (see *Figure 9-6*).
3. Roll the Mylar gasket and hold it in the opening of the Gantry.

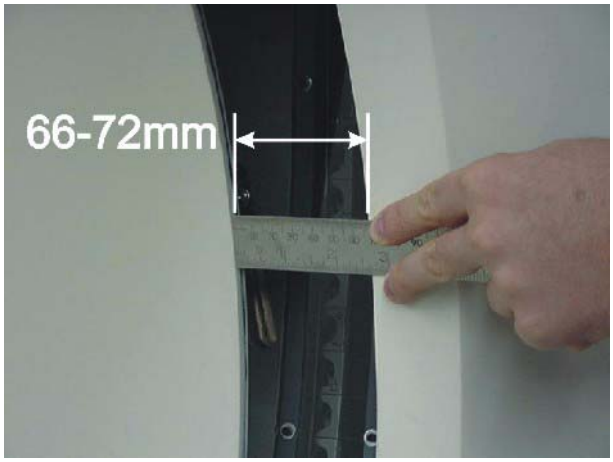

Figure 9-6:

4. Beginning from the top, press the Mylar gasket into the groove, and pull it through the groove along the entire circumference of the Gantry opening, while pressing it firmly into the groove with the palm of your hand.

NOTE

•Never try to push the Mylar gasket; only use a pulling motion.

•It is easier to install the Mylar gasket if you apply a silicone lubricant in the groove.

5. If the Mylar gasket is too long, mark the required length, remove the gasket from the groove, cut it and reinstall it.
6. When the Mylar gasket is completely installed in the groove, continue to pull it until the opening between the ends is in either the **three o'clock or the nine o'clock position**.

NOTE

The overlapping or adjoining of the two ends of the mylar gasket at the **12 o'clock position** can cause the appearance of a black spot in the center of the image after performing phantom calibration.

7. Tighten the two screws that lock the front cover of the Gantry in place, that you loosened in step *1*.

NOTE

To remove the Mylar gasket, loosen the screws that hold the front cover of the Gantry in place, and open the front cover ***very slowly***, until the gasket snaps out.

Closing the Duct Covers

Secure the covers of the ducts in the floor in place. Make sure that they are perfectly level with the floor and there are no bumps or uneven spots on which people could trip.

License Key Installation

Every system delivered to the customer has only basic software enabled. The license key must be installed to enable the additional optional software that was purchased with the system. The license key is included in the system file delivered with the system,

Enter an option license key as follows:

1. Login as **root**. Open a Unix shell.
2. Type: **cd /usr/usp.root/tamar/bin/** and press **<ENTER>**.
3. To verify the path, type: **pwd** and press **<ENTER>**.
4. Type: **./setpwd** and press **<ENTER>**.
5. Enter the license key by typing 16 groups of 4 hexadecimal digits in each group from a printout according to your system S/N.
6. After completing all groups it asks for the checksum number.
7. At the prompt, insert the **Mx8000 V2.13** CD-ROM and wait until it is mounted.
8. Type: **cd /usr/diamond.root/Install** and press **<ENTER>**.
9. Type: **./install_proc** and press **<ENTER>**.
10. At the prompt, reboot the system by typing: **/etc/reboot** and pressing **<ENTER>**.

Entering Service (IRS) Diagnostic Key

1. Log in as **root**
2. Type: **cd /usr/diamond.root/diagnostic** and press **<ENTER>**.
3. Type: **./installKey** and press **<ENTER>**.
4. Enter the 32 hexadecimal digit and the 4 check sum number from a printout according to your system S/N.

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ETL Label (for Canada Only)

To comply with Canadian ETL Regulations, attach the label P/N 705-7100-4905 to the CT-Box as shown in the figure below.

Figure 9-7: ETL Label Placement

Scan Test

To ensure correct functioning of the system perform some scans in different modes:

- Surview
- Axial
- Helix

Change the following parameters for each of the modes listed:

- Slice Width (Pitch);
- Resolution
- Voltage (Kv)
- Scan Times
- Current (Mas)

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Installing the Network

The Mx8000 workstation complies fully with DICOM 3.0 standard.

Mx8000 communication with other stations is based on the DICOM-3 standard. This enables the Mx8000 to communicate with any DICOM-3 compliant products (including other vendors' scanners, workstations and hardcopy units).

Mx8000 can send and retrieve images to and from other stations, and other stations can retrieve and send images from and to the Mx8000. The Mx8000 can function both as a server and as a client. Images are transferred in the DICOM-3 protocol, based on TCP/IP as a transport layer and on Ethernet as a data-link layer.

Communication is through an Ethernet network that meets IEEE 802.3 specifications. The supported media types are:

- **10Base2** (also known as Coax, BNC, Thicknet) supports connection over a distance of up to 180 m (610 ft.). On this network, up to 30 nodes can be daisy-chained on a thin coaxial cable.
- **Thick Ethernet** supports connection over a distance of up to 480 m with the RG213U cable. On this network, the nodes are connected non-intrusively to the cable. A transceiver is required for this connection.
- **10BaseT** supports connection to a wiring hub by twisted-pair cables with RJ-45 connectors. This option supports a maximum length of 200 m using shielded cable, or 100 m using unshielded cable.

The hardware connection medium is transparent to the network software.

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Mx8000 Network Configuration

This section explains how to customize the network configuration of the Mx8000 workstation for the specific requirements at the site.

During network configuration you define all the devices and systems which are connected to the Mx8000 workstation, including devices connected directly to the Mx8000 (such as Hard disk, EOD drive, AMC), and systems which are connected to the Mx8000 via the Ethernet network (such as CT scanners, DICOM compatible devices, etc.).

Network configuration is performed by opening dialog boxes (Network, Node Configuration, and Device Configuration dialog boxes) and entering the parameters which correspond to your requirements.

This section describes the following:

- *Network Configuration Terminology*
- *Using Configuration Dialog Boxes*
- *Setting the IP Address*
- *Configuring the System*
- *Screen Examples for Different Network Configurations*

NOTE

When connecting the Mx8000 to the network, in addition to the Mx 8000, it is also necessary to configure all other systems on the network, so that they will recognize the Mx8000 workstation.
To configure these systems, refer to the documentation for each.

When connecting the Mx8000 to another DICOM compatible station, you must provide the other station with the Internet Address of the Mx8000 workstation, and the **Name** and **AE Title** of some of the following devices: disk, memory, temp disk, EOD device, AMC, Archive Manager, Memory Manager, spooler, film previewer.

When connecting the Mx8000 to a CT scanner, you must configure the LAN in the Mx Twin scanner.

Network Configuration Terminology

This section defines some terms that relate to network configuration.

AE Title: Each device has a unique logical address in DICOM communication. This logical address is called AE Title.

Device: Each node can include one or more devices. A device can be used to import data (for example, a scanner which produces images), to store and handle the data (for example, the local disk which stores images), or to export data (for example, an AMC device which is used to film images).

DICOM Digital Imaging and Communications in Medicine. A standard defining image format and communication protocol between medical imaging stations.

Internet Address (IP)

All devices on the network have a unique Internet address. The format of the Internet address is **x.y.z.w** where x,y,z,w are integers between 0 to 255 (e.g., 192.1.1.1).

These four integers are divided into two fields. The first (left-most) field is called the network address and should be identical for all the nodes in the network, unless routing is used). The second field is the node address and must be unique for each node in the network.

The format of the network and node addresses is determined by the following rule:

- If **x** is between 0-127, the network is a Class A network. In this case, the network address consists only of **x**, and the node address consists of **y.z.w**.
- If **x** is between 128-191, the network is a Class B network. In this case, the network address is **x.y**, and the node address is **z.w**.
- If **x** is between 192-255, the network is a Class C network. In this case, the network address is **x.y.z**, and the node address is **w**. This is the most common type of network.

Netmask A netmask is a logical grouping of the systems in the network. A custom netmask can be defined. However, the default netmask should be used unless the network administrator at the site assigns a custom netmask.

Network Connection

The Mx8000 can be connected to other Mx8000 stations, CT Scanners, MxView workstations and DICOM-3 compliant scanners, workstations, printers and laser imagers through an Ethernet network.

Node Each DICOM-3 compliant station in the network (Ethernet) is considered a node for Network Configuration purposes. There are three kinds of nodes:

- The local Mx8000 workstation to be configured
- Remote Mx8000 workstations that are connected to the local one.
- Other DICOM-3 compliant scanners, such as, workstations.

Using Configuration Dialog Boxes

This section explains how to work with data fields and buttons in the Network Configuration dialog boxes.

Data Fields

Data fields are used to view and edit data. To change data in a data field, click on the field or use the **<Tab>** key to move the cursor to the field, and type the new data. You can use the left and right arrow keys and the **<Backspace>** key to edit the data in the field.

To exit from the field, click the mouse outside the field or press the **<Tab>** key. The validity of the data will be checked. If the new data is not legal (for example, it contains an illegal character or an integer which is out of range), the field will be highlighted.

<Expert Mode> Button

The **Node Configuration** dialog box and the **Device Configuration** dialog box include an **<Expert Mode>** button, which toggles between Basic configuration mode and Expert configuration mode. In Basic configuration mode, the dialog box shows fields that are usually changed. In Expert configuration mode, additional fields which should rarely be changed are displayed.

⚠ CAUTION

Don't change the value of any field in expert mode unless you are absolutely sure of what you are doing.

<OK> Button

Each dialog box has an **<OK>** button. Clicking the **<OK>** button confirms the current settings in the dialog box. If they are legal, the dialog box closes. If any is not legal (for example, one data field is empty), an appropriate message appears, and the dialog box stays open.

The configuration defined by the fields in the dialog box takes effect only after the **<OK>** button is clicked.

<Cancel> Button

Clicking the **<Cancel>** button closes the dialog box and cancels all changes which were made.

Setting the IP Address

The IP address consists of four fields (for example 192.132.141.211). The first three fields are the IP network address. The fourth field is the node address of the workstation.

Mx8000 and the other computer should be configured to have the same IP network address (the first three numbers of their IP addresses should be the same), so that they can access one another over the Ethernet.

Computers on the same network should have different node addresses.

To set the IP address of the Mx8000 workstation:

1. Login as **root** (use password: **pkserv99**).
2. From the **System** menu in the Toolchest, choose **System Manager**. The **System Administration** window opens up.
3. In the menu at the left of the **System Administration** window, choose **Network and Connectivity,** and in the menu at the right, choose **Network Interface Manager**. The **Network Interface Manager** window opens-up.
4. Click the **<Configure>** button.
5. In the next window, click the <**Next>** button.
6. In the next window, click the <**Next>** button.
7. Type the IP Address in the appropriate field.
8. Verify that the **Use default netmask** check box is not checked.
9. Type the following in the **Netmask** dialog box: 0xffffff00
10. Click the **<Next>** button.
11. Click **<OK>** to confirm your settings.
12. Close all open windows. Restart is not required.

NOTE

After setting the IP address, the system is automatically set to Network mode (as opposed to Standalone mode).

Configuring the System

This section describes the following configuration activities:

- Logging in for configuration
- Backing up LAN configuration files
- Adding, removing and configuring nodes
- Adding, removing and configuring devices

Logging In for Configuration

To configure the system, you have to be logged in for configuration. Therefore, if you are logged in, log out. Then, do the following:

1. Log in as **config**, with **config95** as the password. The main configuration menu appears. Currently it has the following two fields:
   - **Network Configuration** for changing the network configuration.
   - **Exit** for terminating the configuration.
2. Click on **Network Configuration.** The **Network Configuration** dialog box opens. This dialog box enables you to:
   - Add nodes to the network.
   - Remove nodes from the network.
   - Open a node dialog box (to change its parameters).

CAUTION

If you change the network configuration, the images waiting to be copied or printed are cleared. In addition, the workstation will automatically be rebooted when you terminate the current configuration session.

Adding Nodes

To add a node to the network, do the following:

1. Click the **<Add ...>** button. A list of types of nodes that can be added appears.
2. Click on the required option. A small dialog box opens.
3. Type the name of the new node, and click the **<OK>** button. The appropriate **Node Configuration** dialog box opens.

Removing Nodes

To remove a node from the network, do the following:

1. Select the node by clicking it.
2. Click on the **<Remove Node>** button.

Configuring Nodes

The **Node Configuration** dialog box is used to configure an existing node or a new node. It enables you to do the following:

- Change the parameters (fields) of the node.
- Add devices to the node.
- Remove devices from the node.
- Change the parameters of an existing device.

To open the **Node Configuration** dialog box, double click on the node. The fields that are displayed change according to the configuration of the Mx8000 workstation.

To change the data in a field click on it, and type the new data.

Basic Node Fields:

Name The name of the node. This name is used to create the default names and AE Titles for the devices in the node.

Syntax: 1-6 characters, where each character may be a letter, a digit, a minus sign (-) or an underscore (_).

IP (only if the node is not the local Mx8000)
The Internet address of the node.

Syntax: x.y.z.w, where x,y,z,w are integers between 0 and 255.
We recommend that you not use 0 and 255.

Expert Mode Fields:

Port The port number that is used by the devices in the node for DICOM communication (unless another port is defined for the device).

The default is the DICOM standard port (104).

ARTIM Time-out (in seconds) for DICOM communication. The default is five seconds.

Client Devices (only if the node is the Local Mx8000):

A list of devices that are used as DICOM clients on the Mx8000. Normally, these devices should not be changed.

Devices:

The **Node Configuration** dialog box includes a scroll list of the existing devices in the node. Devices may be any of the following:

- Disk - The hard disk of the Mx8000.
- Memory - The memory of the Mx8000.
- Temp Disk - Used for temporary storage on the Mx8000.
- EOD - Erasable Optical Disk drive.
- Demo - Used to store a limited number of images for demonstration and tests.
- AMC - A laser imager that is connected to the Mx8000 via an AMC box.
- CT Station - A CT scanner or an MxView workstation.
- Export - Used to export images to files.
- Printer - A foreign DICOM printer or laser imager.
- Storage - Foreign DICOM storage device (such as a scanner, PACS).

To change device parameters, or to add or remove a device, display the Node Configuration dialog box. Then, do one of the following procedures.

Adding Devices

Use the following procedure to add a device to the node:

1. Click on the **<Add ...>** button. A list of devices that can be added is displayed.
2. Click on the device you want to add. The **Add Device** dialog box opens.
3. Enter the device name. Verify the settings by clicking **<OK>**.

Removing Devices

Use the following procedure to remove a device from the node:

1. Select the device by clicking on it.
2. Click on the **<Remove Device>** button.

NOTE

The following devices cannot be removed: Disk, Memory, Temp Disk and Demo.

Configuring Devices

You change the parameters of an existing device in the **Device Configuration** dialog box. To open it, double-click the name of the existing device in the scroll list in the **Node Configuration** dialog box.

The **Device Configuration** dialog box opens. Make the required changes.

This section contains a description of the general device fields in the **Device Configuration** dialog box and the syntax for each. In addition, the sections that follow contain the same information for **Device Configuration** dialog box fields that apply to the following specific devices:

- A CT Station Device
- An AMC Device
- An Export Device
- An arbitrary DICOM Storage Device
- An arbitrary DICOM Printer Device

Basic Fields:

Name The name of the device as displayed to the user (in the Archive Manager and in the applications).

Syntax: 1-10 characters, where each character is either a letter, a digit, a minus sign (-) or an underscore (_).

AE Title The Application Entity Title of the device. This is the address of the device as defined in DICOM. The AE Title must be unique for each device. (Two devices may not have the same AE Title.)

Syntax: 1-16 characters.

Expert Mode only:

Max PDU Size

The maximal size of a PDU which is used by the device for DICOM communication.

Syntax: A positive integer.

Exec Path The name of the program to be executed.

Syntax: A name of a file, including the full path.

Exec Parameters

Additional parameters.

Syntax: Device dependent.

Database Path (only for some devices)
The full path of the database that is used by the device.

Syntax: A name of a directory, including the full path.

Fields for a CT Station Device

Local Station The number of the local station in the CT_LAN configuration files.

Syntax: A single digit between 0 and 4.

Remote Station
The number of the remote station in the CT_LAN configuration files.

Syntax: A single digit between 0 to 4.

IP Address The internet address of the remote station.

Syntax: x.y.z.w, where x,y,z,w are decimal numbers between 0 and 255.

Define EOD toggle
This toggle switch specifies whether or not the remote station has an EOD device.

EOD Name (only when **Define EOD toggle** is ON)
The name of the EOD device as displayed to the user (in the Archive Manager and in applications).

Syntax: 1-10 characters, where each character is a letter, a digit, a minus sign (-) or an underscore (_).

EOD AE Title (only when **Define EOD toggle** is ON)
The Application Entity Title of the EOD device. This is the address of the device as defined in DICOM. The AE Title must be unique for each device. (Two devices may not have the same AE Title.)

Syntax: 1-16 characters.

Fields for an AMC Device

Capability File
The name of the file that describes the capabilities of the printer or the laser imager. It must be one of a given set of known printer types.

Fields for an Export Device

Basic Fields:

Destination Directory
The name of the directory to which the images are exported.

Syntax: A file name, including the full path.

Transfer Syntax

The DICOM Transfer Syntax in which the exported files should be written. One of a given set of possibilities (as defined in DICOM).

Expert Mode only:

Conversion Program

The program that converts the exported files to another format (a non DICOM format).

Syntax: A name of a file, including the full path.

Conversion Parameters

Parameters of the conversion program.

Syntax: Depends on the conversion program.

Fields for an Arbitrary DICOM Storage Device

Basic Fields:

Image Transfer Operation

Determines how images will be transferred, as follows:

- **From Device** - from the device to the Mx8000.
- **To Device** - from the Mx8000 to the device.
- **To/From device** - both directions.

Icon Type The type of icon that is displayed in the Archive Manager. One of a given set of icons. Currently there are three icons: Hard Disk, Optical Disk and Scanner.

Expert Mode only:

Port The number of the port that is used by the device for DICOM communication. By default, it is the port number defined in the node parameters. If this parameter is changed, it overrides the value that is defined for the node.

Fields for an Arbitrary DICOM Printer Device

Basic Field:

Capability File

The name of the file that describes the capabilities of the printer or the laser imager. One of a given set of known printer types.

Expert Mode only:

Port The port number that is used by the device for DICOM communication. The default is the DICOM standard port (104).

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Screen Examples for Different Network Configurations

This section shows dialog boxes for the following Mx8000 network configurations:

- *Standalone Mx8000*
- *Standalone Mx8000 with EOD Device*
- *Standalone Mx8000 with AMC*
- *Standalone Mx8000 with EOD Device and AMC*
- *Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner*
- *Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner with EOD Device*
- *Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner with EOD Device and OmniView Workstation*
- *Mx8000 Connected to a Foreign Scanner*

Use the examples that correspond to your configuration.

Standalone Mx8000

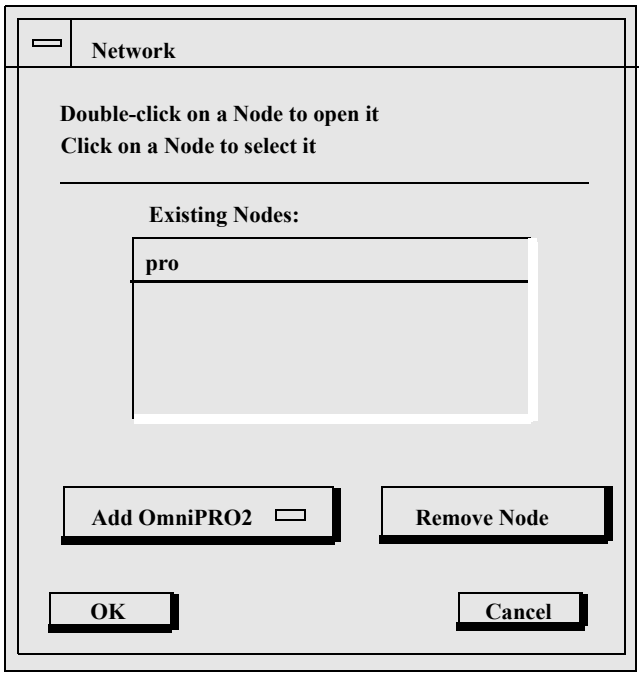

Figure 9-8: Standalone Mx8000 - Network Configuration Dialog Box

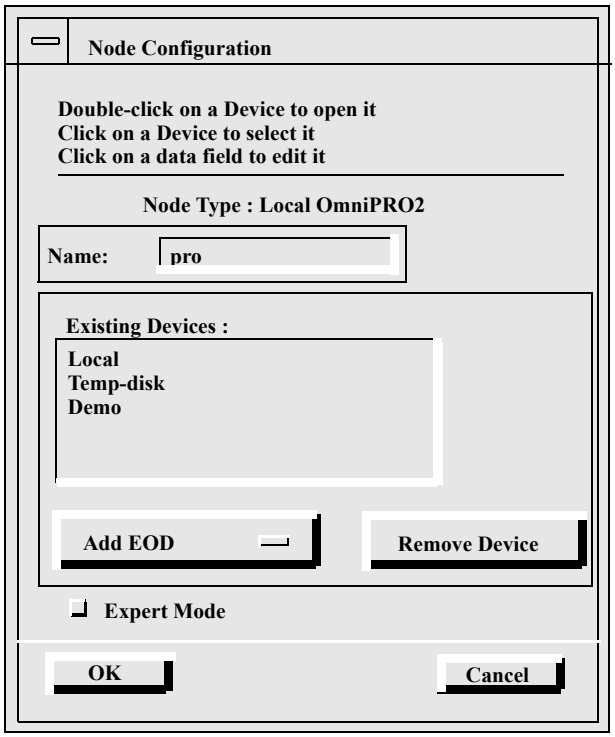

Figure 9-9: Standalone Mx8000 - Node Configuration Dialog Box

Figure 9-10, *Figure 9-11*, and *Figure 9-12* show the **Device Configuration** dialog boxes for a local disk, a temp disk and a demo respectively.

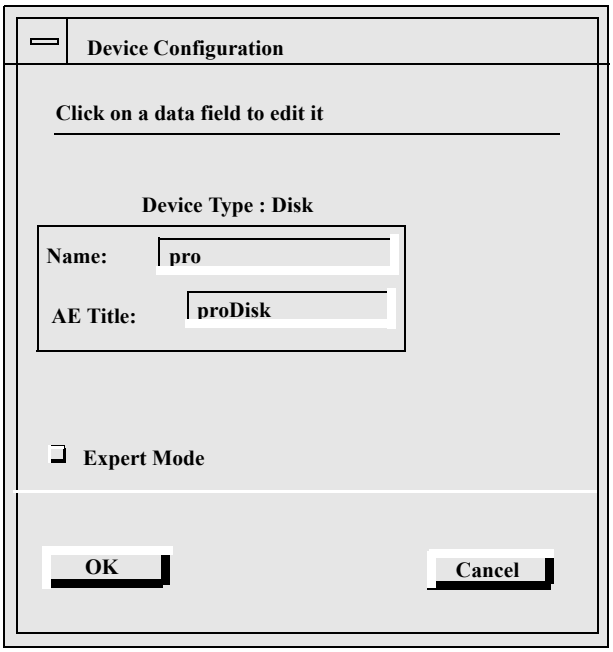

Figure 9-10: Standalone Mx8000 - Device Configuration Dialog Box for Local Disk

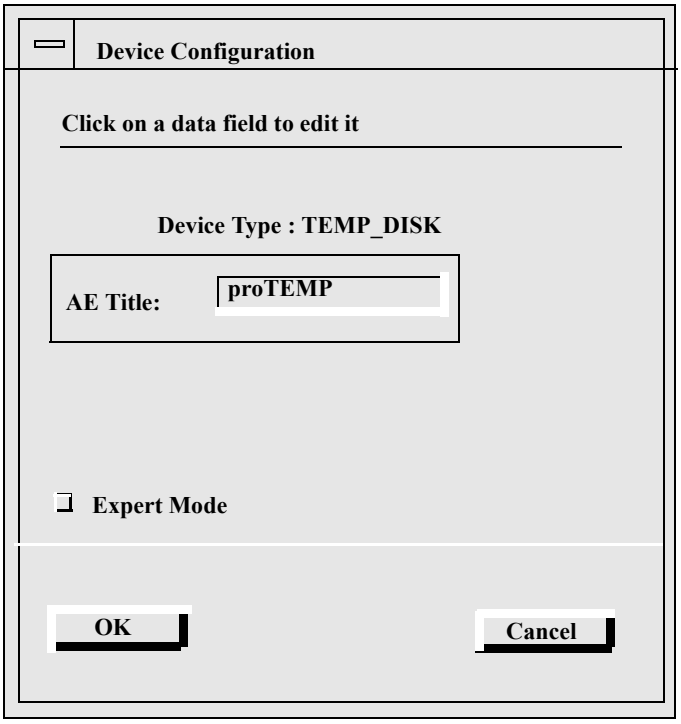

Figure 9-11: Standalone Mx8000 - Device Configuration Dialog Box For Temp Disk

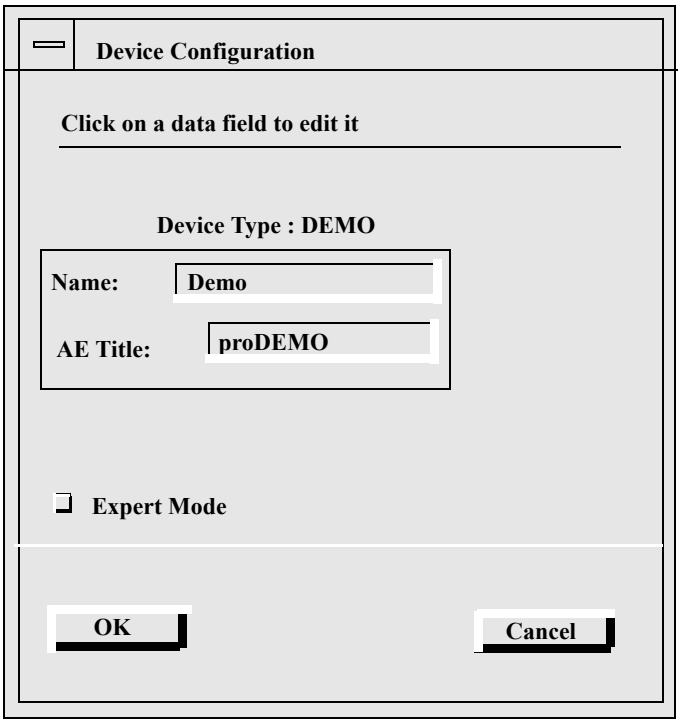

Figure 9-12: Standalone Mx8000 - Device Configuration Dialog Box For Demo

Standalone Mx8000 with EOD Device

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box, see *Figure 9-13*.

For **Device Configuration** dialog boxes, see to *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo), and *Figure 9-14* (EOD device).

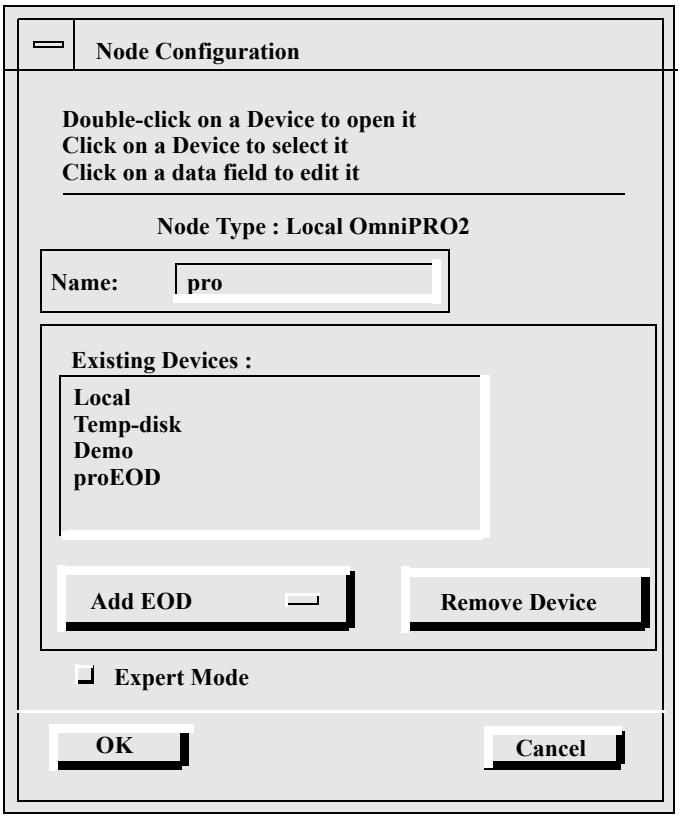

Figure 9-13: Node Configuration Dialog Box for Stand Alone Mx8000 with EOD Device

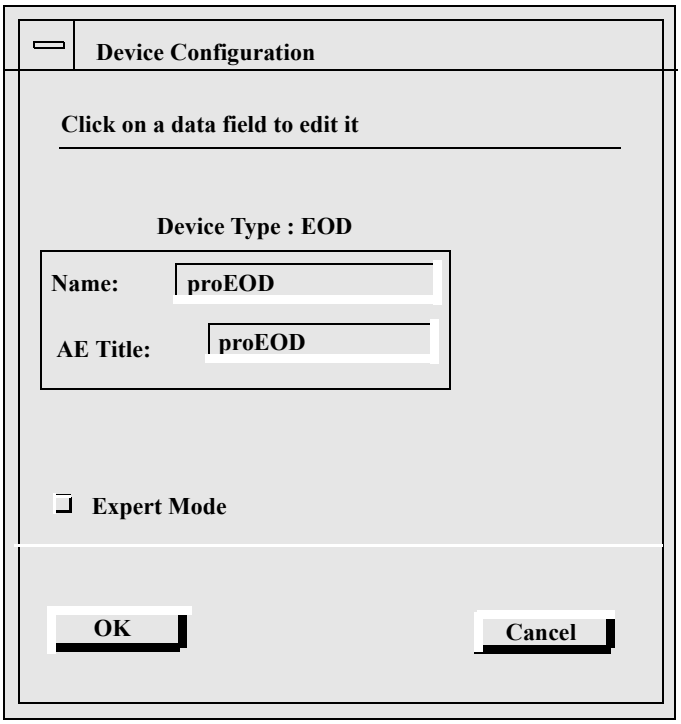

Figure 9-14: Device Configuration Dialog Box for EOD Device

Standalone Mx8000 with AMC

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box, see *Figure 9-15*.

For **Device Configuration** dialog boxes, see *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo) and *Figure 9-16* (AMC).

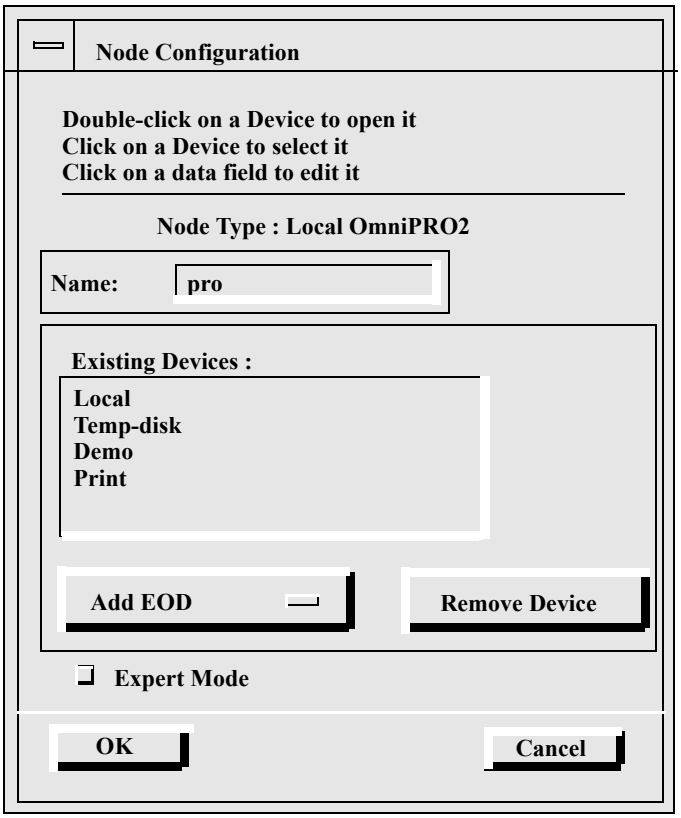

Figure 9-15: Node Configuration Dialog Box for Standalone Mx8000 with AMC

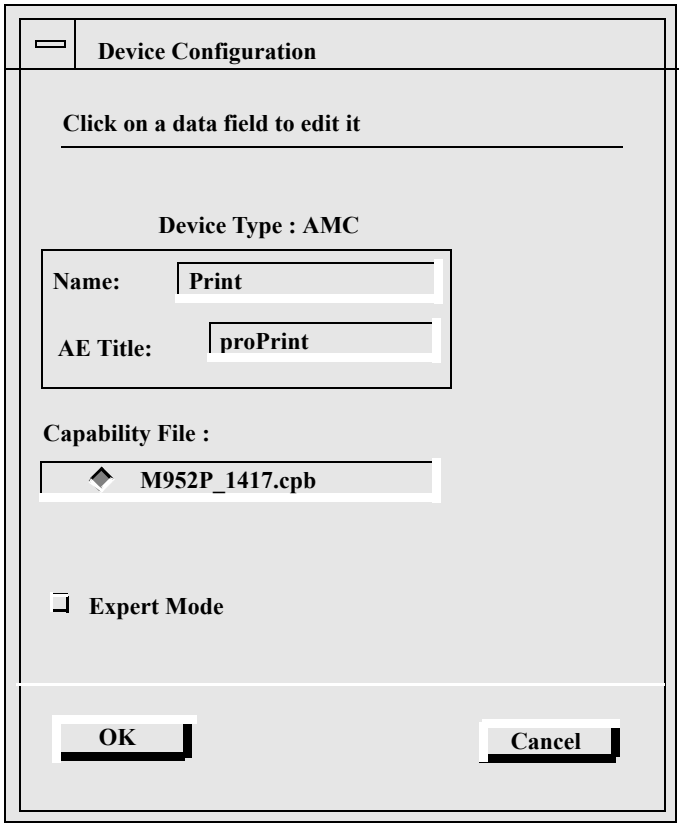

Figure 9-16: Device Configuration Dialog Box for AMC

Standalone Mx8000 with EOD Device and AMC

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box for Standalone Mx8000 with EOD device and AMC, see *Figure 9-17*.

For **Device Configuration** dialog boxes, see *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo), *Figure 9-14* (EOD device) and *Figure 9-16* (AMC).

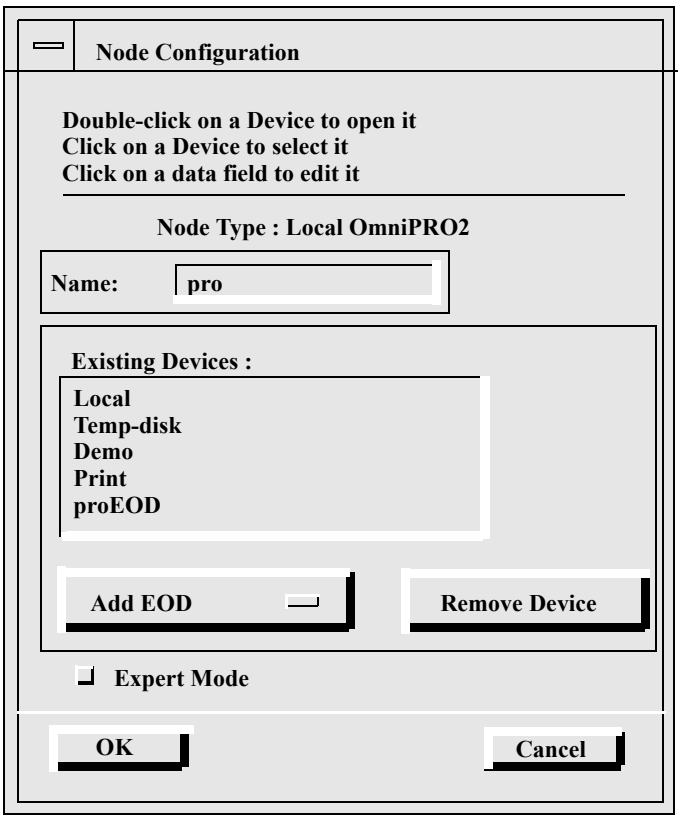

Figure 9-17: Node Configuration Dialog Box for Stand Alone Mx8000+EOD Device + AMC

Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box, see *Figure 9-18*.

For the **Device Configuration** dialog box, see *Figure 9-19*.

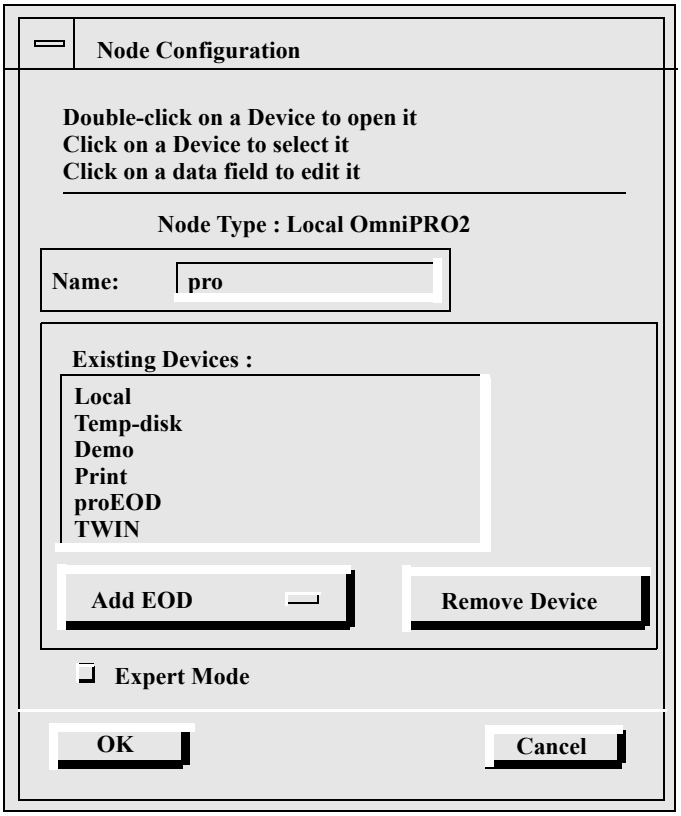

Figure 9-18: Mx8000 Connected To Mx Twin Scanner - Node Configuration Dialog Box

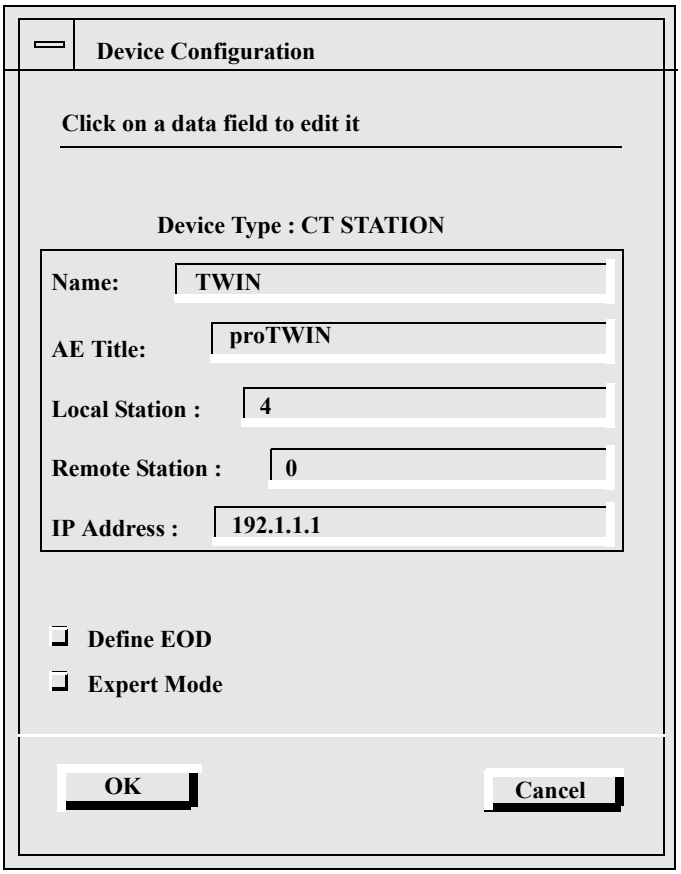

Figure 9-19: Device Configuration Dialog Box for a Mx Twin Device

Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner with EOD Device

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box, see *Figure 9-18*.

For **Device Configuration** dialog boxes, see *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo), *Figure 9-14* (EOD device), *Figure 9-16* (AMC), and *Figure 9-20* (Mx Twin scanner with EOD device).

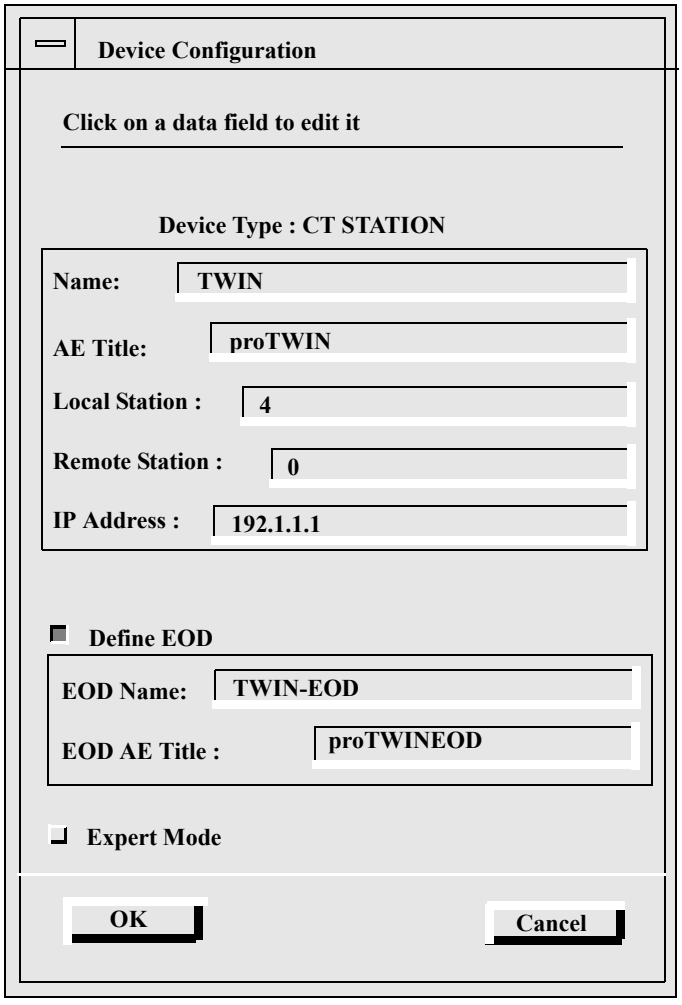

Figure 9-20: Device Configuration Dialog Box for Mx Twin Scanner with EOD Device

Mx8000 with EOD Device and AMC Connected to Mx Twin Scanner with EOD Device and OmniView Workstation

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog box, see *Figure 9-21*.

For the **Device Configuration** dialog boxes, see *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo), *Figure 9-14* (EOD device), *Figure 9-16* (AMC), and *Figure 9-22* (OmniView device).

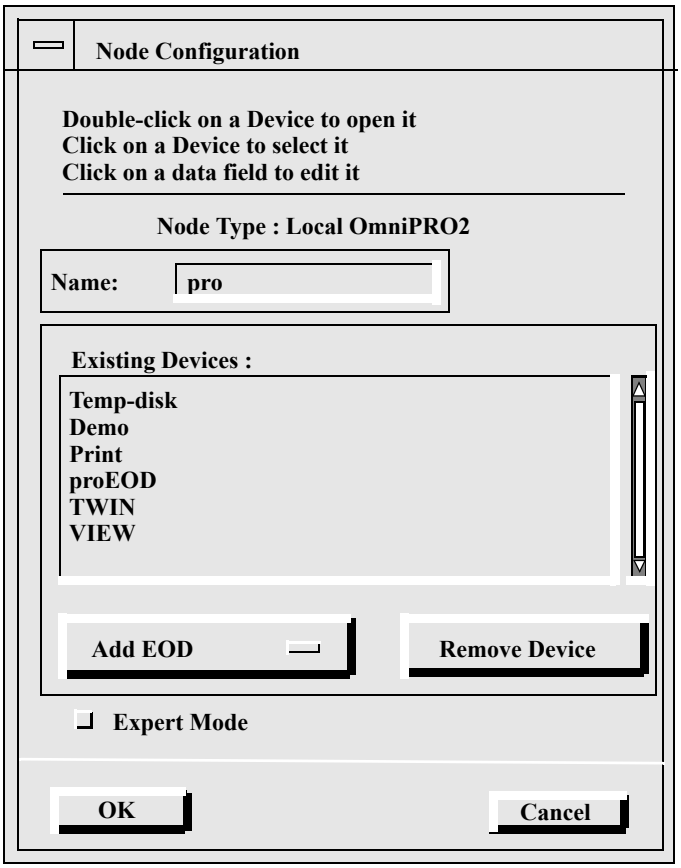

Figure 9-21: Node Configuration Dialog Box for Mx8000, Connected to Mx Twin Scanner and OmniView Workstation

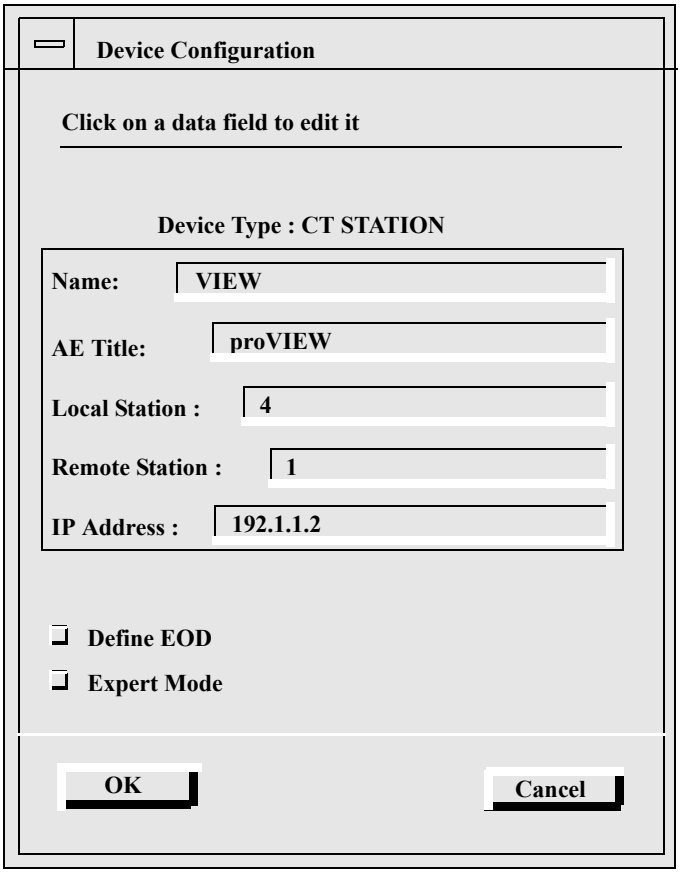

Figure 9-22: Device Configuration Dialog Box for an OmniView Device

Mx8000 Connected to a Foreign Scanner

For the **Network Configuration** dialog box, see *Figure 9-8*.

For the **Node Configuration** dialog boxes, see *Figure 9-9* (local disk) and *Figure 9-24* (foreign scanner).

For the **Device Configuration** dialog boxes, see *Figure 9-10* (local disk), *Figure 9-11* (temp disk), *Figure 9-12* (demo), and *Figure 9-25* (foreign scanner).

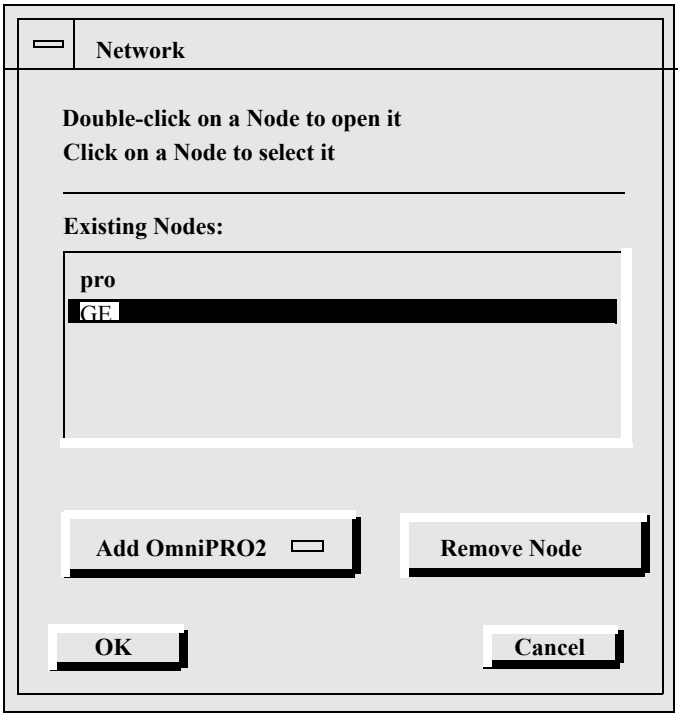

Figure 9-23: Mx8000 Connected to a Foreign Scanner - Network Configuration Dialog Box

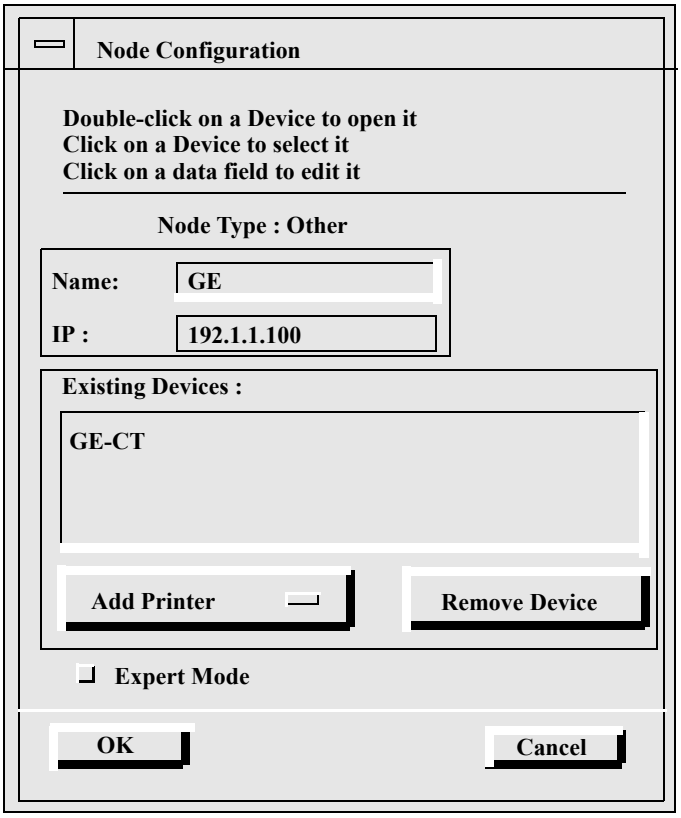

Figure 9-24: Node Configuration Dialog Box for a Node that Contains a Foreign Scanner

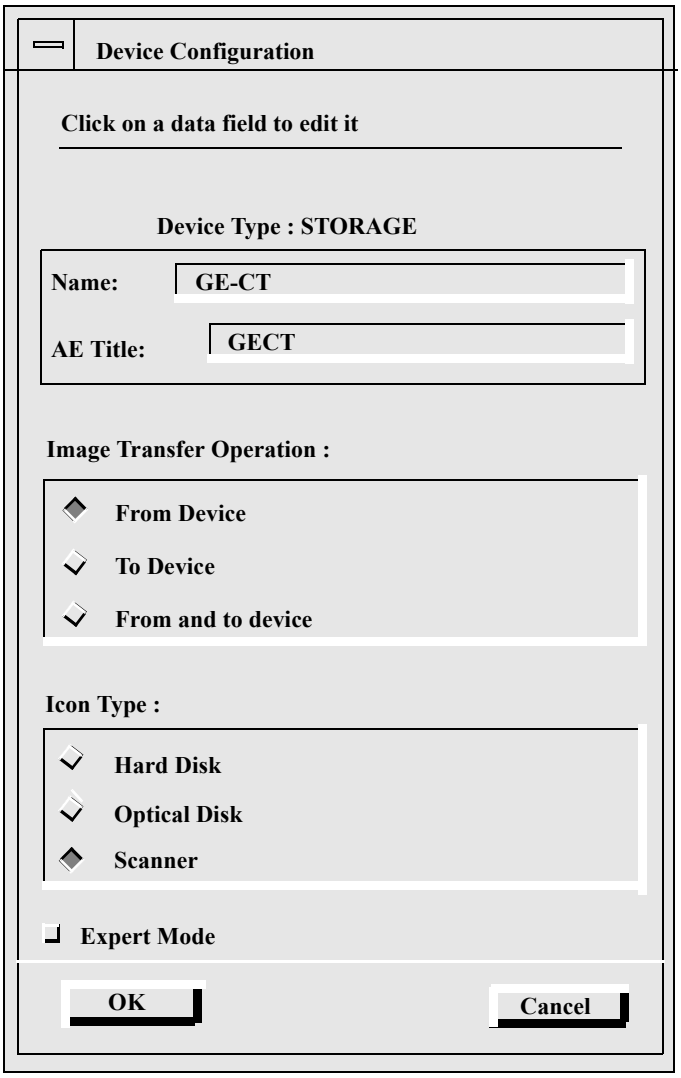

Figure 9-25: Device Configuration Dialog Box for a Foreign Scanner

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Chapter 10
Acceptance Test & Installation Report

Preface

Since the system has been adjusted to optimum setting and has passed all quality assurance tests in the factory prior to delivery, it is likely that test results still are within the tolerances during and after installation procedure.

To ensure that all parameters of the system are in the stated tolerances, perform the acceptance test before to transferring it to the customer.

No adjustment of the system is required before performing the acceptance test. The only calibrations absolutely necessary prior to the acceptance test are air calibrations.

To ensure a high image quality before performing air calibrations and acceptance test, bring the system to the nominal operating temperature. To accomplish this make sure that all following conditions are true:

1. Back and front Gantry covers are closed and mylar gasket is installed
2. Water-water or water-air system is connected and functioning
3. The DMS has been in the ON position at least 5-6 hours
4. The entire system has been ON for at least 2 hours

Air Calibrations

Perform the air calibrations for all possible scan modes as follows:

1. Login the system.
2. On the menu bar, click **Misc|Air Calibration|All.**
3. Follow all instructions given by the system.

Acceptance Test

NOTE

If you are in the USA, you must perform the Mx8000 CDRH Test Instructions and fill in the results tables on the relevant pages before performing the acceptance tests and completing the installation report provided in this chapter. Refer to the **Mx8000 CDRH File Tests and Results** for the required tolerances.
Download the above-mentioned file from Philips Medical System On-line Service Documentation (CFE) at
http://svcinfo.cle.ms.philips.com/ct/mx8000/mainpage/mx8000.html
Click **Service Manual | Calibration** and select the file according to your software version and modality (Quad or Dual).

This section describes the acceptance test for the system. It includes the following measurements and checks:

1. Z-Alignment check
2. DFS and Axis Calibration check
3. Impulse Response Measurement
4. Slice Width measurement
5. Image noise (SD) Measurement
6. Image Quality Check

Perform the above-mentioned tasks according to the appropriate chapters from the Physics file. Download the Physics file from Philips Medical System Online Service Documentation (CFE) at:
http://svcinfo.cle.ms.philips.com/ct/mx8000/mainpage/mx8000.html

Click **Service Manuals | Calibration** and select the Physics file according to your current software version and modality (Quad or Dual). The Physics file contains the procedures performed and tolerances required.

Delivery and Installation Report

Complete the Installation Report provided below, duplicate it and send one copy to each of the following:

1. Cleveland service headquarters
2. PMSTL Service Engineering

Delivery and Installation Report

Product Line: _____ **Date: _____**

To: _____
Cc:_____
From:_____

Please fill in this two-page form for the system you just installed. Attach a detailed report when needed (and mark the correct box). This report does not replace any other reports (complaints or insurance claims).

1. Product: _____ S/N: _____

Customer (or ICPO #): _____

Country: _____

Check Box		Additional Report Attached	
OK	**Failure**		
2. Arrival and Package Condition			
☐	☐	Container:_____ _____	☐
☐	☐	Anchoring: _____ _____	☐
☐	☐	Wrapping: _____ _____	☐
☐	☐	Labeling: _____ _____	☐
☐	☐	Impact Indicator (If needed): _____ _____	☐
☐	☐	Missing Packages: _____ _____	☐
☐	☐	Unexpected missing items: _____ _____	☐
3. Product Condition			
Check Box		**Additional Report Attached**	

OK	Failure		
☐	☐	Damaged Parts: _____ _____	☐
☐	☐	Loosened Components/Parts: _____ _____	☐
☐	☐	Operation Faults _____ _____	☐
☐	☐	Special Difficulties: _____ _____	☐
4. Milestones (when available)			
	Starting Installation Date: _____ First Clinical Use: _____ Acceptance Date: _____		
5. Application and Acceptance Information (when available)			
☐	☐	_____ _____ _____	☐

Test Equipment

Complete all necessary information listed below.

1. VICTOREEN PANORAMIC survey meter model 470A,Serial #
   Date of last calibration:
2. CAPINTEC electrometer model 192, or Serial #
   Keithley dosimeter/kVp readout model 35050A,Serial #
   Ionization chamber model PC 4P, Serial #
   Date of last calibration:
3. UDT photometer model 161, Serial #
   248 sensor
   photometric filter and
   footcandle diffuser
   Date of last calibration:
4. Aluminum 1100 plate - 5 mm thick, 50 mm wide and 300 mm long.
5. Lead strip - 5 mm thick, 50 mm wide and 270 mm long.
6. 1-meter ruler with millimeter divisions, for all countries except U.S.A.
7. Calipers 0.02 mm accuracy, for U.S.A. systems.
8. System phantom
9. Weights to be distributed uniformly on bed - 50 kg and 100 kg.

Certified Components

1.	Mx8000 Gantry	Model: #7180 - 0609Serial #
2.	X-ray Tube Assembly:	
	Housing	Model: 1P 4791 006Serial #
	Insert	Model: 1P 5571 505Serial #
3.	Beam Limiter	Model: # 4806498Serial #
4.	Workstation	Model: # 7180- 0104Serial #
5.	X-ray High Voltage Generator	
	Electronic box generator	Model: # 4819400Serial #
	High Voltage Transformer	Model: # 4818915Serial #
6.	Patient Table	Model: # 7180 - 0302Serial #

DATE: _____ **NAME:** _____ **SIG.** _____

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Appendix A
Electrical Line Inspection

The following document outlines all the necessary checks to evaluate the behavior of the electrical line to the system.

This document includes the following sections:

- Test procedure
- Measurement checklist and corrective actions

Line Impedance Measurement Kit P/N 407-7181-8008

The Line Impedance Measurement Kit contains the following:

ITEM	DESCRIPTION	P/N	QTY
1	PROFiTEST 0100S-II Line Impedance Tester	BR71800010S	1
2	Electrical Line Inspection and Corrective Action Tests Report	491-7171-2503	1

Test Instruments Required

- PRO*Fi*TEST 0100S-II by METRAWATT—Line Impedance Tester
- Test set in K100 Carrying Case – M509H (Optional)
- DVM Fluke 87 (True RMS) or equivalent
- GND extension cable (8m)—purchased locally
- Torque screwdriver capable of adjustment to 1.2 Nm (10.6lbs/in)

NOTE

The PRO*Fi*TEST 0100S-II is delivered from the vendor with an initial German language interface. To change the interface language, follow the instructions in Section 3.2 in the PRO*Fi*TEST 0100S-II Operating Instructions manual.

Estimated Time

Estimated time for the procedure is two hours not including corrective action.

If TEAL (**PLC—Power Line Conditioner**) is installed, fill in the entire checklist.

If TEAL (PLC) is not installed, skip *A.2.2 Measured Values on TEAL (PLC) / WDC Input* .

For systems with WDC without TEAL (PLC), fill in the entire checklist.

WARNING

The measurement is done with power ON.
Make sure not to short between terminals when taking measurements.
The Gantry can be OFF or ON.

Measurements must be done in two places:

NOTE

Clean the measurement contact points before taking readings. Oxidation or corrosion on the contact points will yield unstabel or inaccurate readings.

1. On the TEAL (PLC) input power connection (if TEAL is installed). Perform *Section A.2.2* and *Section A.2.4*.
2. On the input power terminals in the PDC (see Section *Section A.2.4*).

NOTE

If any measurements are not within the required specification, corrective action must be taken.

A.1 Test Procedure

A.1.1 Test Preparation

WARNING

Turn OFF the UPS if present in the system.

1. Turn OFF the input power to the PDC or to the TEAL (PLC).
2. Remove the caps of the input 3-phase terminal of the PDC (F100) and, if measuring on TEAL (PLC) input, make sure that you have access to the TEAL (PLC) input power.
3. Turn ON the input power to the PDC/TEAL (PLC).

NOTE

For measuring voltages, use the DVM Fluke 87 or equivalent according to the checklist on page A-6.

Figure A-1: PROFiTEST 0100S-II Line Impedance Tester

4. Turn ON the PROFiTEST 0100S-II Line Impedance Tester by pressing the yellow Menu button and perform the following measurements:

A.1.1 Checking the Line Impedance L–L

1. Turn the Function Selector switch to the Z Schl. position.
2. Connect the L1 probe to one of the phases and the PE (L2) measuring adaptor to the second phase.
3. Press the Start button, read the measurement on the display, and record the measurement in the checklist.
4. Repeat Steps 2 & 3 according to the checklist.

A.1.2 Checking the Impedance Between Line–Neutral

1. Turn the Function Selector switch to the Z Schl. position.
2. Connect the L1 probe to one of the phases and the PE (L2) measuring adaptor to the Neutral terminal.
3. Press the Start button, read the measurement on the display, and record the measurement in the checklist.
4. Repeat Steps 2 & 3 According to the checklist.

A.1.3 Checking the Impedance Between L–GND

1. Turn the Function Selector switch to the Z Schl. position.
2. Connect the L1 probe to one of the phases and the PE (L2) measuring adaptor to GND.
3. Press the Start button, read the measurement on the display, and record the measurement in the checklist.
4. Repeat Steps 2 & 3 According to the checklist.

A.1.4 Checking the Impedance Between Neutral –GND

1. Turn the Function Selector switch to the RE position.
2. Connect the L3 (N) probe to the ground jack on the side of the PROFiTEST 0100S-II Line Impedance Tester.
3. Connect the L1 probe to one of the phases and the PE (L2) measuring adaptor to the PE terminal.
4. Connect the L3 (N) probe to the Neutral terminal.
5. Press the Start button, read the measurement on the display, and record the measurement in the checklist.

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A.1.5 Checking the Resistance Between PE-Component GND

1. Turn the Function Selector switch to the RE position.
2. Connect the L3 (N) probe to the ground jack on the side of the PROFiTEST 0100S-II Line Impedance Tester.
3. Connect the L1 probe to one of the phases and the PE (L2) measuring adaptor to the PE terminal.
4. Connect the L3 (N) probe to each one of the component GND (use the extension GND cable.
5. Press the Start button, read the measurement on the display, and record the measurement in the checklist.
6. Repeat Steps 4 & 5 for each GND component. Refer to *Ground impedance of the system installation* on page A-12.

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A.2 Measurement Checklist and Corrective Actions

A.2.1 Nominal Line Parameters—Distribution Panel

	REQUIRED LINE AND EQUIPMENT DATA	PRESENT LINE AND EQUIPMENT DATA
Fuse type and rating (on site installation)	Min.:100 A NH gl/gG Selectivity 1:1.25 or Min.:125 A NH gl/gG selectivity 1:1.6	
Type of net: delta,Y,grounding point on secondary side of house transformer	Y with center grounding	
Frequency	50 or 60 Hz	
Output Power Line Voltage	380 400 420 440 460 480	
GFCI type and rating (Ground Fault Control Indicator)	125A 30mA for alternating and DC current	
Over-voltage and lightning protection, type and rating	Lightning protection at station transformer And Surge protection down to 2 kV level in CT power connection panel.	
UPS installed (Type and tech.data)	No nominal equipment (not supplied by PHILIPS)	
Line conditioner (Type and tech.data)	No nominal equipment (not supplied by PHILIPS)	
No other load connected to the CT power line	No other load allowed	
Emergency power supply installed	No nominal equipment	

Check that the GND and N (if present) are isolated from the Power Distribution Panel. If not, isolate them.

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A.2.2 Measured Values on TEAL (PLC)/WDC Input

	NOMINAL VALUE	MEASURED VALUE
LINE FREQUENCY	50 or 60 Hz +/-5%	
Measurement equipment used type, manufacturer, serial number and calibration date.		
LINE VOLTAGE		
Measurement equipment used type, manufacturer, serial number and calibration date.		
Voltage L to L	380 V +/-10% 400 V +/-10% 420 V +/-10% 440 V +/-10% 460 V +/-10% 480 V +/-10%	
L1-L2	List measured values in the column on the right	
L1-L3		
L2-L3		
L to GND	220 V+/-10% 230 V+/-10% 243 V+/-10% 254 V+/-10% 265 V+/-10% 277 V+/-10%	
L1- GND	List measured values in the column on the right	
L2- GND		
L3- GND		

LINE IMPEDANCE		
Measurement equipment used type, manufacturer, serial number and calibration date.		
L to L	380V:max 0.150 Ω 400V:max 0.165 Ω 420V:max 0.180 Ω 440V:max 0.200 Ω 460V:max 0.220 Ω 480V:max 0.240 Ω	
L to GND	max 0.150 Ω	
L1-L2 L1-L3 L2-L3L2-L3 Perform measurement according to *Section A.1.1*.	List measured values in the column on the right	
L to GND	Smaller than measured values L to L	
L1- GND L2- GND L3- GND Perform measurement according to *Section A.1.3*.	List measured values in the column on the right	

A.2.3 Corrective Action

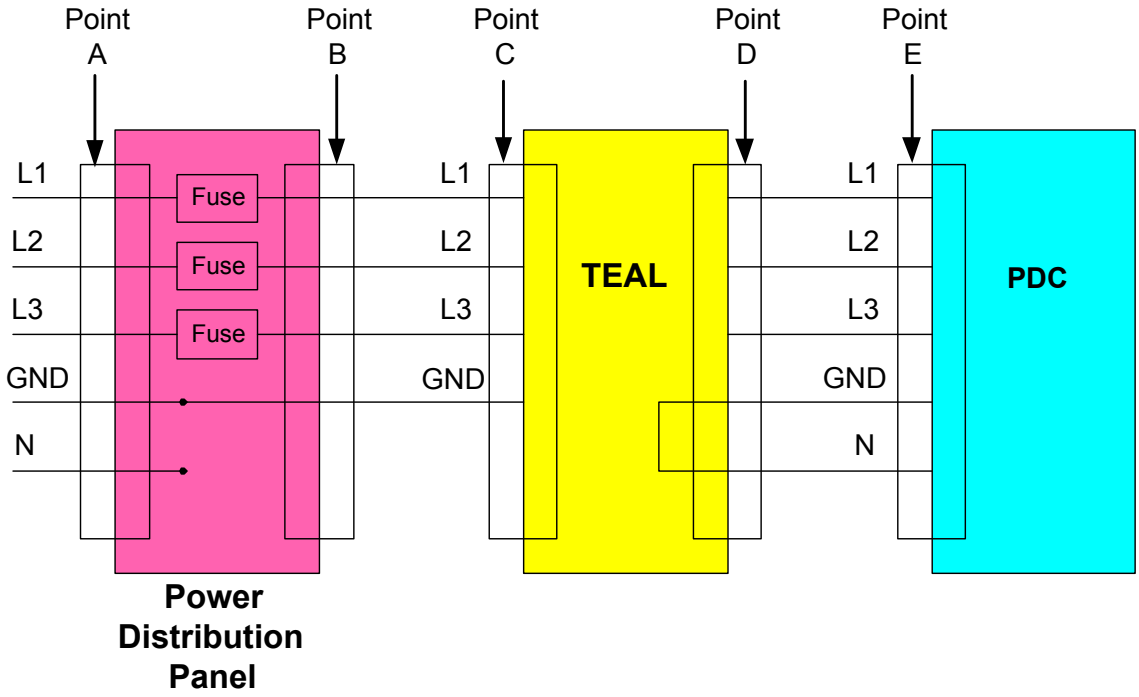

Figure A-1: Connection Block Diagram (with TEAL)

If any of the measurements taken in Section *Section A.2.2* are not within tolerance:

1. Check for loose connections on the TEAL (PLC) input terminal (Point C).
2. Contact the site electrician and perform the measurements in Section *Section A.2.2* at Point B.
3. If the measurements are within the tolerances, check the cables between Points B and C. For example, the cable length may be too long, or the cable diameter is too small (not thinner than $25mm^2$—AWG3).
4. If the measurements are not within the tolerances, contact the site electrician and check for loose connections on the Power Distribution Panel output terminal (Point B).
5. Contact the site electrician and perform the measurements in *Section A.2.2* at Point A.
6. If the measurements are within the tolerances, contact the site electrician and check the fuses and connections inside the Power Distribution Panel.
7. If the measurements are not within the tolerances, contact the site electrician and check the input lines from site power source:
   — Check for loose connections at power source.

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— Check that there is no voltage difference >1VAC between GND and N and that they are connected together.

— Check that the GND cable diameter is $25mm^2$ or higher.

A.2.4 Measured Values on PDC Input

	NOMINAL VALUE	MEASURED VALUE
LINE FREQUENCY	50 or 60 Hz +/-5%	
Measurement equipment used type, manufacturer, serial number and calibration date.		
LINE VOLTAGE		
Measurement equipment used type, manufacturer, serial number and calibration date.		
Voltage L to L	380 V +/-10% 400 V +/-10% 420 V +/-10% 440 V +/-10% 460 V +/-10% 480 V +/-10%	
L1-L2	List measured values in the column on the right	
L1-L3		
L2-L3		
L to N	220 V+/-10% 230 V+/-10% 243 V+/-10% 254 V+/-10% 265 V+/-10% 277 V+/-10%	

L1-N	List measured values in the column on the right	
L2-N		
L3-N		
PE-N	<1V	
LINE IMPEDANCE		
Measurement equipment used type, manufacturer, serial number and calibration date.		
L to L	380V: max 0.150 Ω 400V: max 0.165 Ω 420V: max 0.180 Ω 440V: max 0.200 Ω 460V: max 0.220 Ω 480V: max 0.240 Ω	
L to N	max 0.150 Ω	
N to GND	max 0.150 Ω	
L1-L2	List measured values in the column on the right	
L1-L3		
L2-L3 Perform measurement according to *Section A.1.1*.		
L1-N	List measured values in the column on the right	
L2-N		
L3-N Perform measurement according to *Section A.1.2*.		

IMPEDANCE FROM GROUND CONNECTION PE OF THE SYSTEM INPUT TO THE NEAREST CONNECTION OF N.		
Measurement equipment used type, manufacturer, serial number and calibration date.		
Impedance from ground connection PE of the PDC cabinet to the nearest connection of N. Perform measurement according to *Section A.1.4*.	Value smaller 0.150 Ω	
GROUND IMPEDANCE OF THE SYSTEM INSTALLATION		
Measurement equipment used type, manufacturer, serial number and calibration date.		
PDC protective conductor terminal to every conductive surface on a system component	Value smaller 0.100 Ω	
1. Gantry	List measured values in the column on the right	1.
2. Table		2.
3. WCS		3.
4. Local GND in Distribution Panel Perform measurement according to *Section A.1.5*.		4.

A.2.5 Corrective Action

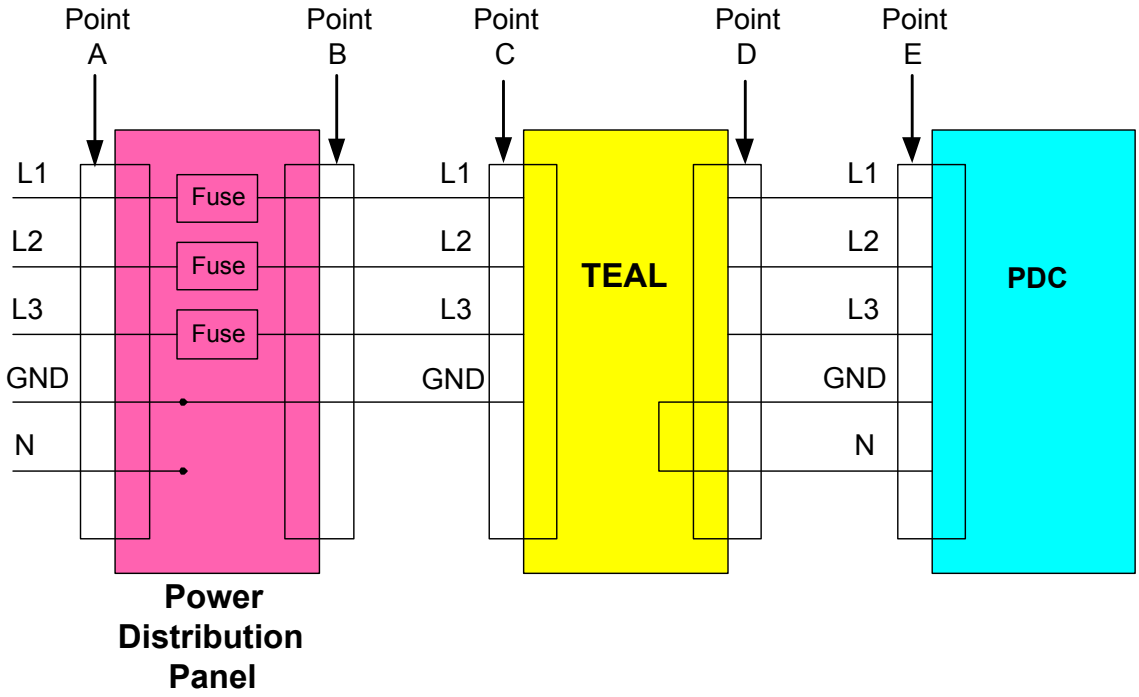

Figure A-2: Connection Block Diagram (with TEAL)

For Systems With TEAL (PLC)

If any of the measurements taken in Section *Section A.2.4* are not within tolerance:

1. Check for loose connections on the PDC input terminal (Point E).
2. Perform the measurements in *Section A.2.4* at Point D.
3. If the measurements are within the tolerances, check the cables between Points D and E. For example, the cable length may be too long, or the cable diameter is too small (not thinner than $25mm^2$—AWG3).
4. If the measurements are not within the tolerances, check for loose connections on the TEAL (PLC) output terminal (Point D). Check the connection between GND and N inside the TEAL (PLC).

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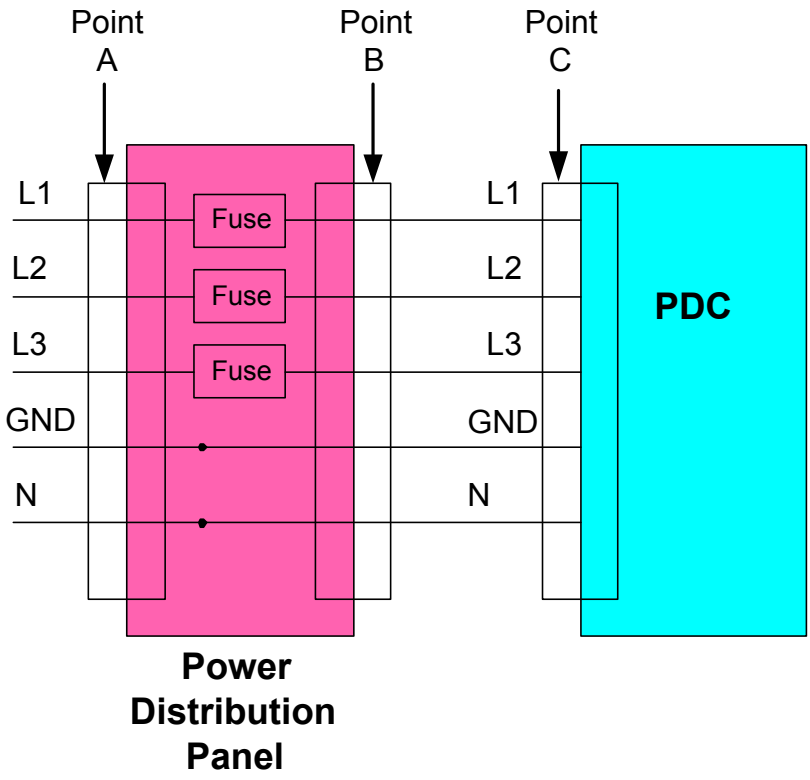

Figure A-3: Connection Block Diagram (without TEAL)

For Systems Without TEAL (PLC)

If any of the measurements taken in Section *Section A.2.4* are not within tolerance:

1. Check for loose connections on the PDC input terminal (Point C).
2. Perform the measurements in *Section A.2.4* at Point B.
3. If the measurements are within the tolerances, check the cables between Points B and C. For example, the cable length may be too long, or the cable diameter is too small (not thinner than $25mm^2$—AWG3).
4. If the measurements are not within the tolerances, contact the site electrician and check for loose connections on the Power Distribution Panel output terminal (Point B).
5. Contact the site electrician and perform the measurements in *Section A.2.4* at Point A.
6. If the measurements are within the tolerances, contact the site electrician and check the fuses and connections inside the Power Distribution Panel.
7. If the measurements are not within the tolerances, contact the site electrician and check the input lines from site power source:

- Check for loose connections at power source.

- Check that there is no voltage difference >1VAC between GND and N and that they are connected together.
- Check the GND cable diameter is $35mm^{2.}$

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